COMPUTERWORLD

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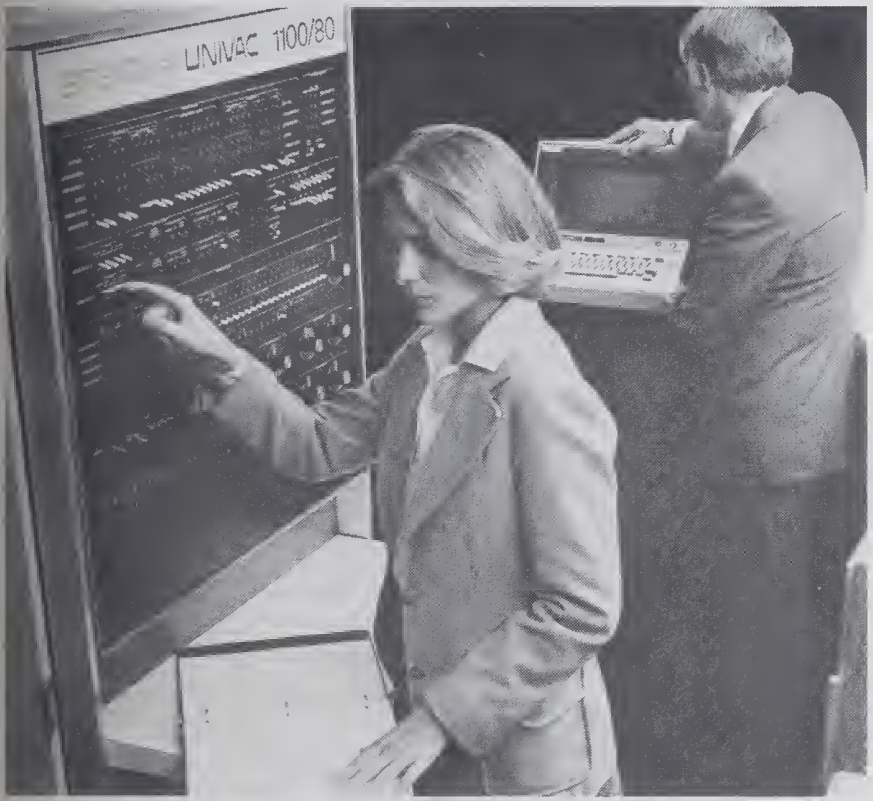
NEWSPAPER



Univac introductions included entry-level 1100/80.

Five High-End Systems Swell Univac Offerings

By Don Leavitt
CW Staff

BLUE BELL, Pa. — The parade of new equipment grows longer. In the biggest announcement in its history, Univac last week introduced five systems at the high ends of its product lines.

Two of the systems are in the company's byte-oriented 90/80 "family" while the other three are extensions of the word-based 1100 series. All were described as alternatives to IBM's large 370s or the newer 30 series processors, as well as "natural growth paths" for installations already using Univac gear.

The 1M-byte 90/80-2 with a 130-nsec machine cycle time is said to generate "nearly 50% more central processor power" than the IBM 370/148 while being price-competitive with the IBM equipment.

The 90/80-3, starting at 1M byte of main memory and expandable in 1M-byte increments, has a machine cycle time of 98 nsec and also outperforms the 148, according to Univac. IBM users trying to match the power of the full-blown 4M-byte 90/80-3 would have to move to a 3031 processor, a spokesman claimed.

The 1100/80 extensions cover both ends of that part of the 1100 range. An entry-level 1100/80 system is said to offer users a better price/performance than the IBM 3031 while the three- and four processor systems — the 1100/83 and 1100/84 — "exceed the IBM 3032 and 3033 in performance," in Univac's view.

The "83" and "84" are the largest and most powerful systems currently offered by Univac, the spokesman noted. First deliveries of all models announced last week are scheduled during the second quarter of 1978, he added.

Easy Upgrading

Upgrading to those models should not be difficult for current Univac sites. The 90/80 extensions utilize the same VS/9 operating system as previous 90 series models, and the entire 1100 line runs under the 1100 operating system, so no conversion effort will be required, according to the spokesman.

In all cases, peripherals that can be used with existing models of either series of processors can also be used with the models just introduced, he said.

The latest 90/80 systems are made up of four major components — an in-

(Continued on Page 6)

Users Say Privacy Measures Make Good Business Sense

By Catherine Arnst
CW Staff

NEW YORK — Several users that have voluntarily set up their own fair information practices say protecting the privacy of personnel records "makes good business sense."

It makes good business sense because it improves employee relations, according to Donald Dewey, IBM program manager of personnel information.

Dewey, along with representatives from several other major companies that would be regulated if a privacy law for the private sector were passed, shared their experiences during a panel discussion held as part of a three-day briefing entitled "Privacy Regulation: Implications for the Business Community" conducted here recently by the American Management Associations.

Eliminating unnecessary data collection and restricting who sees sensitive employee information such as performance and medical records, for example, began at IBM in the mid-'60s, Dewey said.

IBM has almost 300,000 employees worldwide and 160,000 in the U.S. alone. In addition to the basic personnel data most employers keep, IBM has several appraisal programs which add to the immensity of its record-keeping system. All these records are completely open to the individual employee, Dewey said.

Coverage of the privacy briefing continues on Pages 12-15.

IBM must balance its requirements for data security with this open records policy. It attempts to separate personnel information from business data and also uses a "two-bucket theory" for collecting data, Dewey said.

One "bucket" of information is that data needed to make a decision on hir-

(Continued on Page 4)

Package Erases Portions of Disk

NASHUA, N.H. — A stand-alone software package that reportedly allows a user to selectively erase portions of data stored on disk has been introduced by Sanders Associates, Inc.

Called the Sanders Associates File Eliminator (Safe), the software runs on IBM 370 mainframes as well as on the newer 3031, 3032 and 3033 processors, according to a spokesman.

Safe operates independently of any mainframe operating system and executes in 256K of memory. The package can work with a variety of IBM disk systems including the 2314, 3330, 3340 and 3350 "or equivalent," Sanders said.

In addition to selectively eliminating data, the package can perform a total overwrite of disk data to eliminate proprietary information at the user's discretion. A triple overwrite of a 3330 double-density disk (808 cylinders) can be accomplished in an average

(Continued on Page 2)

DEC Unwraps 32-Bit Mini As PDP-11 Upgrade Option

By Jeffry Beeler
CW Staff

BOSTON — Users of Digital Equipment Corp. PDP-11s can now run programs as large as 32 million bytes without resorting to partitioning or memory overlaps. That word came from DEC here last week as the firm introduced its first 32-bit minicomputer, an upward extension of the PDP-11 line.

VAX-11/780 provides up to 4.3 billion bytes of virtual addressing space, holds a minimum of 128K bytes expandable to 2 million bytes and can perform in one instruction operations that would require multiple instructions with 16-bit machines, DEC spokesmen said.

A Fortran DO loop, for example, requires only one instruction, and other functions have combined up to 15 operations in one instruction, the company added.

This increased operating speed suits the VAX-11/780 to time-critical scientific and industrial applications like aircraft simulation, power monitoring, process control and data acquisition, according to the firm.

DEC designed the 32-bit system to provide "a natural upward migration for PDP-11 users whose applications require additional address space and functionality," spokesmen said.

Compatible with all other members of the PDP-11 family, the minicomputer comes with an instruction set that uses microprogrammed logic and

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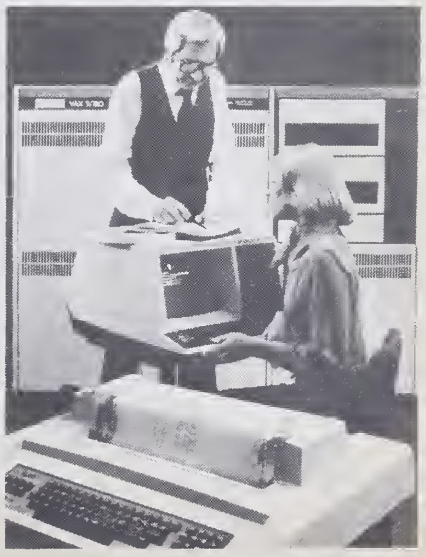

DEC VAX-11/780

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New IBM Examiner in the Works

By Catherine Arnst
CW Staff

NEW YORK — The government has asked that the person it recommended as an examiner in the U.S. vs. IBM antitrust trial be removed because "the public may perceive an appearance of conflict of interest."

The conflict of interest lies in the fact that the appointee is also working for Memorex Corp. as a paralegal in its antitrust suit against IBM [CW, Oct. 10].

The argument now revolves around who should replace him.

Herbert H. Isaacs, a director with Arthur Young & Co., was appointed by Judge David N. Edelstein at the request of the government to seach IBM files for statistical information on its installed systems [CW, Sept. 12]. The search was aimed at assuring the court that IBM had complied with Edelstein's orders for information.

Following Isaacs' appointment, IBM filed a writ of mandamus with the Second Circuit Court of Appeals asking that Isaacs be removed because of his Memorex connection.

At a conference Oct. 6 between attorneys for IBM and the government and Frank Scardilli, staff counsel for the Second Circuit, Scardilli advised the government that it should consider removing Isaacs because of the appearance of impropriety in the eyes of the public and the business community in particular.

Accountant or Lawyer?

Government attorneys apparently would be content with an accountant. In their motion, the Justice Department lawyers expressed the belief that "an accountant's professional experience in objectively evaluating machine-readable business record[s] would be useful in the absence of a technically expert lawyer."

IBM disagrees.

IBM attorneys see the issue of whether IBM has complied with "the spirit and intent" of court orders as a legal one. "We submit that neither an accountant, nor an engineer, nor any other nonlawyer can possibly approach the level of legal expertise and experience required to make that determination," an IBM memorandum said.

The defense also opposes the motion because it sees the government's action as an attempt "to retain absolute, unimpaired control over the list of examiner candidates submitted to the court for consideration." IBM wants a list submitted which is agreed upon by both parties, the firm's counsel indicated.

The government's motion said "IBM has made it clear that it opposes any examiner candidate [who is] not a lawyer, and neither party is likely to find a lawyer technically equipped to find information relevant to machine-readable data which is withheld by IBM. Plaintiff will explain IBM's position to prospective candidates."

IBM Offended

IBM took particular offense at the suggestion that the government would explain the firm's position. "We vigorously oppose [the government's] proposal unilaterally to explain IBM's position. Under no circumstances that I can imagine would such an ex parte communication by [the government] be justified or proper. Whatever [the government] thinks needs explaining, it is plainly not [the government's] function to do it," an affadavit by Thomas D. Barr, IBM lead counsel, said.

Most observers expect IBM to withdraw its writ of mandamus if and when an examiner acceptable to both parties is appointed in this case.

No Free Lunch

Someone is apparently using the *Computerworld* name in an unauthorized manner.

In the past week or so, CW has received calls from users who have been contacted by people identifying themselves as members of the "Computerworld Promotion Department — New Subscriptions" and offering "free" subscriptions in exchange for information on the people who work in the DP department.

Unfortunately, there's no free lunch and people who are making such offers are acting without CW's authorization and misrepresenting themselves if they say they work for us.

If you are contacted by such a person, please try to get his name and number and let us know.

'Safe' Erases Selected Data

(Continued from Page 1)

elapsed time of 18 minutes, the firm claimed.

The software can overwrite multiple disk packs "concurrently to the limit of available disk channels," the spokesman added.

To selectively erase a sensitive portion of data stored on a disk pack, the user cites the starting and ending address of the erase operation, he said. The package also serves as a diagnostic aid to certify disk packs and measure timing variations.

Safe is licensed at $1,750 for the first CPU, $1,200 for the second CPU and $900 for successive CPUs. It is available in 30 days from Sanders Associates, Daniel Webster Highway South, Nashua, N.H. 03061.

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Urges Halt on Implementation

Brooks Slams Proposed I/O Fips as Inadequate

By Molly Upton
CW Staff

WASHINGTON, D.C. — The revised proposed federal standard for channel-level I/O interfaces is "extremely inadequate" and its implementation should be suspended until it can be redrafted, Rep. Jack Brooks (D-Texas) recently told Commerce Secretary Juanita Kreps.

The chairman of the House Government Operations Committee joined a growing list of standards advocates who are dissatisfied with the "watered down" standard formulated by the National Bureau of Standards (NBS) for use by government agencies [CW, Sept. 12].

The revised proposed standard has elicited so many requests for an extension of the deadline for comments that NBS agreed to accept comments until Oct. 28, a spokesman said. The bureau will then prepare a "justification proposal" based on all comments and the economic impact of the standard which it will submit to Kreps for a decision, he explained.

Original Standard Draft

The original standard, based on the IBM channel interface, was drafted by the American National Standards Institute X3T9 committee and by the NBS as a Federal Information Processing Standard (Fips).

In analyzing the proposed Fips' weaknesses in an Oct. 14 letter to Kreps, Brooks said the apparent limitation of the maximum number of required interfaces to four may make the standard "worthless."

"Under this proposal, one channel of a system may meet the standard and another may not. Nonstandard equipment could be introduced to operate with standard types," he stated.

"Such a hodgepodge could degrade technical efficiency, reduce potential competition (current or subsequent), impact adversely on operational software and greatly increase cost," Brooks said in his letter.

Brooks also objected to the provision that agencies would be authorized to procure systems that do not comply with the standard. Cost evaluation of alternative equipment could be used by an agency to avoid acquiring equipment that meets the standard, he observed.

"Such a result would lead ultimately to increased operating costs, lack of competition, increased sole-source procurements and preclusion of subsequent governmentwide reutilization of equipment," he told Kreps.

Practical Effect

Because agency heads are given total responsibility for waiving the Fips, the practical effect would be that of "emasculating the standard," he added.

Brooks said the standard is "made inapplicable to the entire inventory" of federal DP hardware or to any future modifications of such equipment. "A large part of the current inventory of government systems," he said, "could be retrofitted to accommodate the I/O interface standard."

The standard's exemption of minicomputers, microcomputers and other small-scale systems, which now represent a majority of systems procurements, "could have serious unforeseen consequences," the congressman stated.

"Prior to issuance of the proposed standard, consideration should be given to determining the extent to which such categories of systems can be covered by the standard," he recommended.

IBM Not Guilty In Antitrust Part Of Forro Suit

SAN FRANCISCO — Judge Ray McNichols last week ruled in favor of IBM in the antitrust portion of the suit filed against it by Forro Precision, Inc.

The antitrust issues in the suit were left hanging when the six-person jury could not reach a decision on that aspect of the case, thus leaving unmarred IBM's record of never having antitrust charges decided by a jury [CW, Sept 26].

McNichols' decision granting an IBM motion overruled Forro's request for a new trial on antitrust charges.

Awards Appeal

But the judge let stand the awards assigned by the jury of $2.7 million to Forro for alleged interference with its prospective clients and of $260,777 to IBM for Forro's alleged misappropriation of IBM trade secrets.

IBM indicated it will appeal the $2.7 million award and Joseph M. Alioto, attorney for Forro, said he plans to appeal McNichols' decision on the antitrust charges.

Commenting on the decision, an IBM spokesman said, "We are of course pleased with the court's decision. It supports our strong belief that IBM in the conduct of its business has not violated the country's antitrust laws."

In January, another jury will hear more antitrust charges against IBM as the Memorex case goes to court.

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Deregulation Better for Users, Bank Tells FCC

By Molly Upton
CW Staff

WASHINGTON, D.C. — The Seattle-First National Bank — a DP and data communications user — has advocated regulation of common carriers only in areas where a natural monopoly is clearly demonstrated to exist — as is the case with transmission facilities.

With this response to the Second Computer Inquiry, the bank aligned itself more closely with IBM than with AT&T.

The bank's comments were among 26 received by the FCC in connection with its inquiry, a study aimed at clarifying the boundary between data communications and data processing.

"There is a world of difference from the user's point of view in approaching a vendor where the service or equipment to be obtained is tariffed," the bank stated. "When dealing with an unregulated service, there is freedom of bargaining. The service or equipment can be tailored to the user's specific needs and special requirements can be met," the bank's filing continued. In addition, the user can contract for performance standards.

But with a regulated service subject to tariff, nothing can be varied by contract and the carrier's obligations and liability are often substantially limited, the bank indicated.

"The bank wants fewer tariffed teleprocessing services on the market, not more,' according to its filing.

Benefit to Vendors

Deregulation would benefit not only users but vendors, the bank believes, for then AT&T could respond more quickly to competition.

"AT&T and the other carriers should be taken out from under their blanket of regulation and allowed to compete to the maximum extent possible in the free market where there is freedom of action unencumbered by the restraints imposed by tariff regulation. They and their customers will be best served by such an occurence," the bank stated.

Seattle-First National Bank said it agrees with AT&T's initial filing that many users want package services rather than one piece of a network and that common carriers should be allowed to enter the teleprocessing services market.

But, contrary to AT&T's position, the bank sees no reason why a package service cannot be offered by unregulated entities.

AT&T's desire to broaden the definition of communications as used in the Communications Act of 1934 could potentially subject many TP services to regulation which are not now regulated, the bank observed.

Modified Consent Decree

The bank suggested a modification of the 1956 Consent Decree, which it said is warranted by the change in technology and the blurring of the line between DP and communications.

The 1956 Consent Decree restricts AT&T to offering only regulated communications services.

If the court that issued the decree does not wish to modify it," Congress could legislatively take action which would result in modification of the decree," the bank stated. Modification of the decree, which is meant to advance the public good, could serve to "protect the DP industry against unfair competition rather than all competition with AT&T in the teleprocessing market," the bank observed.

In the meantime, the bank suggested that the only tenable solution, which it does not advocate for the long-term, would be to allow carriers to offer a broad range of TP services on a regulated basis.

Any reform of the Communications Act should expressly give the FCC the discretion not to regulate when it determines such a position is in the public interest, the bank said.

But the bank took AT&T to task on its statement that teleprocessing services are best provided in a regulated framework or that teleprocessing is "socially too important to be entrusted to purely private decision making," as AT&T had stated in its first filing.

The bank feels the free marketplace "is generally a much better decision maker than governments" in ensuring that services are provided broadly and with socially desirable attributes.

Seattle-First said it recognizes that there will be some instances where some regulation of teleprocessing services is necessary to prevent abuses, but it added that often antitrust laws will be a sufficient deterrent.

"Where a need for limited regulation exists, Seattle-First National Bank would have no objections. However, the need for limited regulation does not justify all encompassing common carrier tariff regulation," the bank said.

Privacy Makes 'Good Business Sense'

(Continued from Page 1)

ing. The second "bucket" is that information gathered after an employee is hired, Dewey explained.

By analyzing the information requested in the two buckets, IBM was able to eliminate a lot of unnecessary data, he said. For example, it no longer requests a spouse's name because there is no need for this information.

There is also an attempt to keep data current, Dewey said. No grades from traning programs are kept and conviction records are destroyed after three years.

Employees may request their files at any time and are provided with a printout six feet long when they do, he said. With medical records, employees have full access to any records kept for government requirements or any voluntarily requested examinations.

However, doctors' notes are only reviewed with the employee by the doctor, Dewey said, noting this same procedure applies to a manager's personnel file.

As for releasing information to persons other than the employee himself, without prior consent, IBM will only verify employment. With the employee's written approval, the firm will release salary and performance information.

IBM makes an individual decision on each request for information from law enforcement agencies, Dewey said.

Medical Records

Medical records must be protected for much the same reasons Dewey gave for protecting other personnel records — it's good employee relations. Without the confidence of the patient, a doctor cannot get the cooperation needed to make a diagnosis, according to Dr. G.H. Collings Jr., general medical director for New York Telephone.

"The ethics of medical confidentiality has different meanings to different people," Collings said. In cases where the doctor is employed by the company, the doctor-patient relationship involves a third party and the patient can no longer be dealt with in complete secrecy.

However, the patient must feel secure that information won't go too far because the doctor needs the patient's cooperation to perform his job, Collings said.

"Employees universally respond favorably to medical records which guard information but judiciously release conclusions," he added. Conclusions, therefore, should not be kept confidential although neither should they be broadcast indiscriminately.

Low-Priority Item

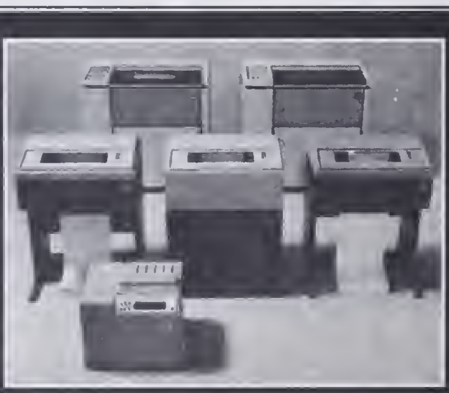
The recommendations of Dewey and Collings exemplified some voluntary efforts businesses are making to meet the recommendations of the Privacy Protection Study Commission's report. It was to foster such voluntary compliance that the commission did not recommend immediate legislation, according to Jane Yurow, project manager for the commission.

The commission took a voluntary approach to compliance in the private sector "because a workable law was unfeasible at this time due to the complexity of recordkeeping," Yurow said.

Record control often tends to be a low-priority item, however. The prevalent attitude seems to be that "only troublemakers and cranks want to see their records," she said.

One weak spot in many corporations is in the area of insurance claim records which are often subjected to only minimal security measures, if at all, Yurow said."Employees should not be required to have company insurance if there are no proper safeguards," she contended, suggesting that information of this type be "walled off" from other employee data.

Yurow also recommended that companies isolate mandatory medical records and pass out only the results and that any records concerning voluntary medical care be treated confidentially, as a private physician would.



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On DP, Communications Regulation

IBM, AT&T Responses Clash in FCC Inquiry II

By Molly Upton
CW Staff

WASHINGTON, D.C. — After a 90-day extension, IBM and AT&T, among others, filed reply comments that essentially echoed their original responses to the Second Computer Inquiry being conducted by the Federal Communications Commission (FCC) [CW, June 13].

IBM continues to maintain that the FCC should regulate at most those carrier services that perform a pure transmission function.

AT&T, on the other hand, reiterated its desire for a broad definition of communication, under which it sees itself operating in a regulated fashion.

The filings of IBM and AT&T were among 26 received by the FCC from various communications and services firms as well as industry groups. Although the Ad Hoc Telecommunications Users Committee, which filed on the first round last spring, made no reply, the user view was present in position papers from banks.

The Second Computer Inquiry, announced more than a year ago [CW, Aug. 9, 1976], seeks to clarify the boundary between data communications and data processing.

According to the FCC's proposal, data processing would be defined as "the use of a computer for the purpose of processing information wherein (a) the semantic content, or meaning, of input data is in any way transformed, or (b) where the output data constitutes a programmed response to input data."

Under the proposed changes, common carriers would be allowed to use DP for "network control and routing and I/O processing. They could offer "arithmetic processing, word processing or process control" only through separate subsidiaries.

Another part of the FCC proposal calls for the elimination of the hybrid services category, established by the First Computer Inquiry.

Under the hybrid services definition, services that are primarily communications-oriented but include incidental DP would be regulated and those services that are primarily DP-oriented but include incidental communications would be unregulated.

IBM Filing

The IBM filing indicated that carriers should be permitted to offer all services, except those that perform a pure transmission function, subject to certain safeguards to prevent commingling.

If necessary, the 1956 Consent Decree, which restricts AT&T to offering regulated communications services should be modified, IBM said.

The IBM document includes an appendix tracing the history of common carrier regulation on competitive activities. The appendix concluded that it would be a mistake to impose regulation on data processing and/or combined communications/DP services because of the higher cost, higher risk and decreased innovation that would likely result.

Regulation has a history of working when applied to "natural monopoly" industries, but of failing when applied to competitive industries, the IBM appendix said.

AT&T indicated that, when making jurisdictional determinations, the FCC must focus upon the service provided by the carrier and not upon the activity of the customer who is using the service.

IBM and others can interpret the commission's terms unrelated to definitions in the Communications Act to serve their own interests, AT&T said.

"We strongly urge the commission to reject suggestions to incorporate either examples of customer processing applications or detailed listings of functions in its final definition of what constitutes 'data processing' services," AT&T stated.

The AT&T reply brief reiterated the firm's position that the FCC's proposed rule be modifed to affirm that common carriers, "in providing communication services to meet increasingly varied and sophisticated user needs, may furnish data processing where it would enhance the service for the customer.

Assure Modern Technology

"Our recommendation would assure that modern processing technology is utilized in communication common carrier services and thus it is in the public interest," AT&T stated.

In addition, AT&T observed that its recommendation is "consistent with the Communications Act in that it recognizes the dynamic concept of 'communication' and the scope of the commission's regulatory jurisdiction embodied in that law and in judicial and administrative decisions."

AT&T's filing rebuts the stance of IBM, the Computer and Business Equipment Manufacturer's Association and others which advocate deregulation of all communication functions except "pure transmission."

Filings by unregulated vendors of data equipment and DP services have gone beyond the scope of Second Computer Inquiry and in some cases are not consonant with the Communications Act, AT&T observed.

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ABCs of ZBB

FAIRFIELD, N.J. — One-day seminars designed to provide attendees with a working knowledge of zero-base budgeting (ZBB) concepts and applications have been scheduled by Rapidata, Inc. in various cities during the next month and a half.

In Boston on Nov. 10, the seminar will feature an address by Peter Phyrr, who helped implement ZBB in Georgia when Jimmy Carter was governor of that state. Phyrr is generally considered the "father of ZBB," a Rapidata spokeswoman said.

In Chicago on Dec. 1 and in New York on Dec. 7, the featured speaker will be Logan Cheek, author of *Zero-Base Budgeting Comes of Age* and a member of the information sciences group at Xerox Corp.

The registration fee for each session is $175, Rapidata said from 20 New Dutch Lane, Fairfield, N.J. 07006.

High-End Systems Extend Univac Lines

(Continued from Page 1)

struction processor, a peripheral processor, a main storage unit and a system console. They are smaller than earlier systems in the line, partly because of the use of 16K semiconductor chips and partly because the instruction processor and peripheral processor have been consolidated in a single cabinet, he said.

Minimum configuration consists of five I/O channels, including one byte multiplexer and four block multiplexers. This is expandable to a maximum of eight channels, including either six or seven block multiplexers and two or one byte multiplexers.

Conversion from a 90/80-2 to a 90/80-3 can be handled through a field engineering change requiring only a few hours, the spokesman added.

Purchase price for the 90/80-2 central processor complex will range from approximately $720,000 to $878,000; five-year gross lease rates will range from $17,600 to $21,600 monthly.

For the 90/80-3 central processor complex, the cost will range from about $900,000 to $1.2 million with five-year lease rates from $22,500 to $29,500 monthly.

Multiprocessor Power

While the entry-level 1100/80 has less power — and a lower price tag — than the 1100/81 introduced last November, the "high-performance" 1100/83 is said to have almost three times the power and the 1100/84 four times the power of the earlier system.

The range of performance includes a two times price/performance advantage of the year-old, single-processor 1100/81 over the IBM 3031, Univac claimed.

The 1100/80 architecture includes both central processing units and I/O units. The basic configuration includes one of each while the maximum configuration has four of each type of unit.

All the systems in this line have a cache or buffer memory as well as a main or backing storage. The single-processor systems have buffers of 4K words expandable to 16K words, while the multiprocessors start at 8K and go up to 32K words.

The main memory of the 1100/80 systems starts at 524,000 words and can be increased in 524,000 or 1M-word increments to a maximum of just over four million words. This part of the hierarchical memory systems uses a 16K semiconductor storage element.

Average buffer access time to the central processor is 100 nsec, the spokesman noted, adding the central processor has a cycle time of 50 nsec.

Basic Configuration

The basic I/O configuration includes six channels (one byte multiplexer, one block multiplexer and four word channels). The full complement includes eight channel modules per I/O processor or 32 channels selected from all the types available.

The entry-level 1100/80 central processor complex will cost approximately $1.23 million and the five-year lease rate will be about $28,000 monthly, according to Univac.

Purchase prices of typical 1100/83 and 1100/84 central processor configurations will vary from $3.7 million to $4.7 million. Five-year lease rates will range from $84,000 to $105,000 each month, the spokesman estimated.

DEC Offers 32-Bit Mini

(Continued from Page 1)

consists of 243 instructions, nine addressing modes and five data types, DEC officials explained. The instruction set also uses the same mnemonics as other PDP-11s and includes integral floating point, packed-decimal arithmetic, character string manipulation and context switching instructions, the officials added.

System Compatibility Increased

To further increase the system's compatibility with other PDP-11s DEC designed the VAX-11/780 to accommodate both DCL and MCR command languages and to implement Fortran-IV-Plus, Basic-Plus-2 and Cobol, the firm said.

The system also uses a Unibus for connecting to small disks, CRT terminals and printers as well as integrated Massbus adapters for interfacing high-speed peripherals like DEC's RP06 disk units and TE16 magnetic tape units, the company continued.

Users can connect one Unibus adapter and up to four Massbus adapters to the system's backplane, spokesmen explained.

Backplane Interconnect

VAX-11/780's Synchronous Backplane Interconnect (SBI) serves as the system's main control and data-transfer path and permits an aggregate throughput of 13.3 million byte/sec with a 1.5 million byte/sec throughput for the adapter pathway between the Unibus and SBI, according to DEC.

Among its other hardware features, the system provides an 8K-byte write-through memory that permits memory accessing in 290 nsec and an optional floating-point accelerator that performs double-precision, floating-point 64-bit addition in 1.4 microsec, the firm said.

The system also provides 16 32-bit general registers and 32 interrupt priority levels, 16 each for hardware and software, the spokesmen explained. Four hierarchical protection modes, each with read-write access control, support the system's paging memory management, they added.

Supported by DEC's VAX/VMS operating system, the minicomputer serves up to 64 interactive users simultaneously and provides batch capabilities that include job control, spooled input and output, operator control and conditional command branching and accounting, DEC said.

Management Facilities

Record and file management facilities include sequential and relative file organization plus sequential and random access. Program development features include two editors, language processors, a symbolic debugger, librarian and utilities, the firm explained.

A minimum VAX-11/780 configuration consisting of the CPU, 128K bytes of ECC MOS memory, an LA36 Decwriter II console, two RK06 14M-byte disk drives, a VAX/VMS operating system and a multiplexer with eight EIA connections costs $128,000, the company said.

With 256K bytes of memory, one RM03 67M-byte disk unit, a TE16 magnetic tape drive and an eight-line multiplexer, the system costs $153,000, while a configuration incorporating an RP06 176M-byte disk drive unit and a TE15 800/1,600 bit/-in. magnetic tape unit costs $185,000, DEC added.

Deliveries of the VAX-11/780 system will begin early next year, the company said from Maynard, Mass. 01754.

Correction

A recent story indicated that Wang's Manufacturing Management System (MMS) is available for the recently introduced Wang 2200VS processor [CW, Oct. 24]. This is not the case, according to a Wang spokesman.

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DATA PROCESSING SECURITY, INC.
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In Accepting DPMA Award

Couger Credits Schools for DP-Wise Managers

By Jeffry Beeler
CW Staff

WASHINGTON, D.C. — Dramatic improvements in undergraduate computer science instruction could someday make computer-shy business managers as much of a rarity as the buggy whip or the windmill.

Each year, the nation's colleges and universities graduate more than 100,000 business administration majors with strong computer science backgrounds. As these computer-literate graduates enter the job market, they take over management positions formerly held by their less technically qualified counterparts.

If this trend continues — and every indication suggests it will — executives who have little or no computer science grounding could find themselves with nothing left to do but "bask in the breeze at their retirement homes," Dr. J. Daniel Couger, professor of computer and management science at the University of Colorado and a *Computerworld* columnist, remarked during a post-luncheon address that marked the final day of Info/Expo '77 here recently.

The luncheon was held to honor Couger's selection as the Data Processing Management Association's (DPMA) Computer Science Man-of-the-Year.

During his address, Couger attributed the recent proliferation of computer-trained executives to a coordinated effort to strengthen computer science instruction at the university level.

This effort is creating a generation of managers for whom computers are a natural part of education and business administration, he said.

On-Line Opposition

Elsewhere in the management world, however, opposition to on-line systems remains as strong as ever, Couger pointed out. He blamed this reluctance to use computers on four factors:

- The widespread belief that use of on-line terminals is somehow beneath the dignity of those in top management.
- A tendency to think the information needs of top executives are less dynamic than those of first-line supervisors.
- Wariness caused by unpleasant experiences with batch systems.
- Skepticism that computers are really necessary for success as an executive.

Couger finds the first argument difficult to accept, he said. By streamlining many time-consuming administrative tasks, computers free managers to spend more of their time on important functions like planning, controlling, organizing and coordinating.

Poor Understanding

The second reason that managers often give for not using computers betrays a poor understanding of the main value of computers, Couger continued. Contrary to what most people think, the primary function of computers is not to speed data processing, but to perform tasks that humans find difficult, he noted.

This capacity for doing tough jobs is perfectly consistent with the needs of top managers, whose analytical powers are tested more and more as they advance up the corporate ladder, Couger explained.

The third obstacle to management acceptance of computers is somewhat easier to understand, he admitted — why should a user who has experienced trouble with batch-oriented applications believe that on-line systems will be any different?

The fourth reason for executive resistance to on-line systems is perhaps the most understandable of all, Couger said. Managers who have advanced to the top of the corporate ranks without the help of a computer frequently ask why they should learn to use a computer now.

CW Photo by J. Beeler
J. Daniel Couger

Guide to Top DPers Updated, Published

PHOENIX — Applied Computer Research has published the latest semiannual issue of the "Directory of Top Computer Executives."

The directory features nearly 400 new entries and over 700 changes. It lists the top decision makers in medium- to large-scale computer installations throughout the country.

Copies of the directory are available for $50 from Applied Computer Research, P.O. Box 9280, Phoenix, Ariz. 85068.

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Small Machines, Big Places — Part 1

Large Users Tending to Centralize Mini Policy

By Esther Surden
CW Staff

WALTHAM, Mass. — Very large companies are feeling the impact of minicomputers and are reacting with policy decisions concerning their selection, purchase, implementation and use, according to a report issued by International Data Corp. (IDC).

"Minicomputers: The Impact on Large Organizations" was based on personal interviews with 24 management information systems (MIS) directors of Fortune 1,000 firms, interviews on distributed DP with 30 MIS directors and other supplemental information compiled by the market research firm here.

A definition of "minicomputer" emerged from these interviews: "For the majority of decision makers, a mini is something that can perform in a fashion comparable to a Digital Equipment Corp. PDP-8 or PDP-11," IDC found.

Large organizations are centralizing their control over minicomputer purchase decision, the report indicated.

For 21 of the 24 organizations interviewed, "the central group has veto power over the acquisition and use of minicomputers throughout the organization."

For four of the 21, this veto power extends to business applications and not minis in the manufacturing/industrial environment, although the MIS department works closely with the industrial group in that decision.

The MIS directors justified their centralization of control in several ways. Purchases of minicomputers should be coordinated with the long-term DP goals of the company and the MIS department is the most likely department to provide the overall view, several firms reasoned. Many of the surveyed organizations noted that enough minis will be purchased over the next few years to provide economies of scale in software development areas. In addition, the MIS department could aid future users by passing on the knowledge gained as a benefit of experience, they said.

More than $1 billion in minicomputer equipment was shipped to U.S. users in 1976, bringing major changes in the way these installations — now numbering about 175,000 — manage the economic and organizational aspects of their information processing.

This two-part series looks at the impact of minis on the larger companies that have installed them.

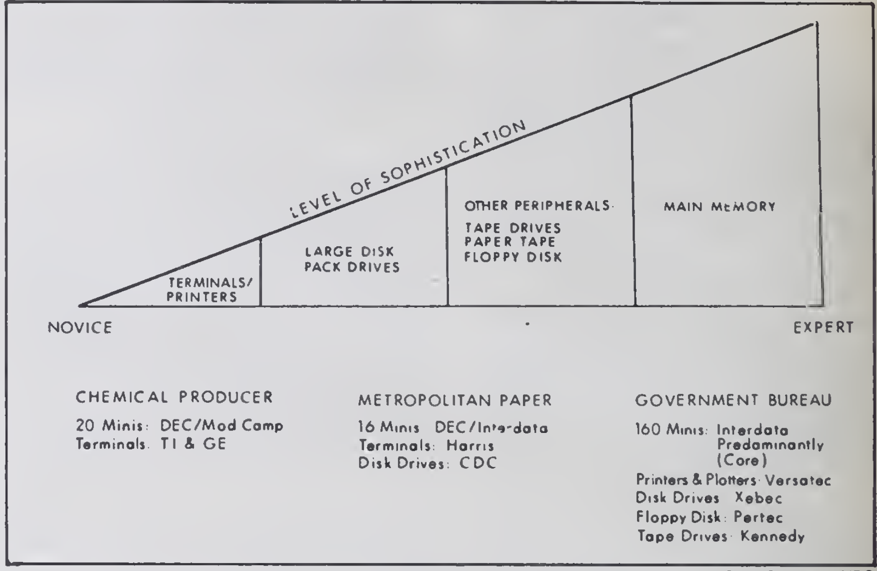

Chart Courtesy of IDC

User Sophistication and Tendency to Buy Independent Peripherals

Other firms rationalized that "quite often, even in the initial use of a minicomputer, some information that would be collected . . . will be useful to the central MIS group, and the only way to determine if that would be the case would be to have the MIS group involved in the selection, specification, application development and installation" of the mini, the report stated.

Also, the companies hoped to prevent history from repeating itself — from adding application after application to the mini while making a corresponding increase in staff to the point that new jobs would be incrementally less efficient.

The companies also thought that having the central group involved would shorten the time needed to acquire and install a mini because the central group would have already reviewed all offerings from various vendors.

Also, the firms said a central group could cut the time needed to develop the software on new minicomputers since it "would already have expertise along the lines of implementing minicomputers . . . This assumes that the central group is responsible to the needs of the organization" and does not put the request in a long waiting queue, the report noted.

The final reason given was that the end-user department was not in the position to evaluate other, non-minicomputer DP solutions to their problems.

Distributed data processing, regardless of the definition used, serves as a focal point around which users can bring the latest technology into the organization and so is an impetus for centralized control, IDC said.

The acquisitions "are under central control, so that potentially all the pieces can function as a network when the time is right," the research organization added.

While the decision-making process was generally controlled by a central department, this did not mean the surveyed companies standardized on particular minis or even on the peripherals

(Continued on Page 10)

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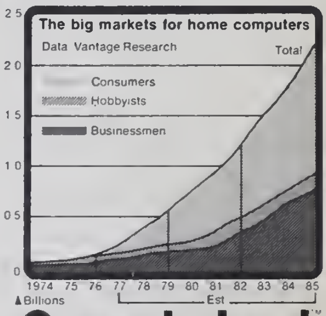

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Programmer Productivity Lagging, Report Says

By Edith Holmes
CW Staff

WASHINGTON, D.C. — Programmers productivity, rather than equipment performance and costs will be the industry's chief problem over the next decade, participants in an American Federation of Information Processing Societies (Afips) report concluded here last week.

The cost/performance ratio of DP hardware has improved by a factor of 100 each decade since 1955, according to T.B. Steel Jr., a member of Share, Inc.'s IBM Liaison Team (Silt) committee, writing in the Afips study, entitled "Information Processing in the United States: A Quantitative Study." He added that all indications and available data suggest that this trend will continue for at least the next 10 years.

At the same time, however, programmer productivity — "A primary factor in the cost/performance ratio for computer software" — appears to be improving at a rate of not much over 3% per year, Steel said.

See related story on Page 51.

Unless new software technology, such as programming languages, structural programming and top-down design, can turn the need from programmer training to training users at intelligent terminals or minicomputers, data processing will become the nation's most labor-intensive industry, with the possible exception of agriculture.

In an afterword to the Afips study, Steel, a consultant, called the predictions made by the Afips report "at best conservative."

Steel based his remarks on a 1976 study he did with T.A. Dolotta and several others, entitled "Data Processing in 1980-85: A Study of Potential Limitations To Progress," which was published by Silt.

13% of GNP

The Silt report, as that study has come to be known, suggested that the DP industry, including every factor from supplier activity to user costs, will account for 13% of the nation's gross national product (GNP) by 1990.

Further, between 15% and 20% of the total U.S. labor force will be required to have some knowledge of data processing and about 65% of that labor force will be dependent in some measure on the use of data processing.

Further data from the Silt report suggests that by 1990 there will be approximately 175,000 large-scale general-purpose computer systems installed at various sites in the U.S. and close to one million dedicated systems for such application areas as process control, inventory management and data entry.

Meanwhile, the computer programmer population will grow to approximately one-third of a million by 1985, Steel said. Despite the lack of consistent occupation definitions which makes forecasting for this profession difficult, almost every study suggests that the maximum number of programmers industry can recruit, train and absorb increases by a factor of three every five years.

Programmer training and productivity becomes "the critical path in dealing with data processing in the next decade," Steel concluded. "We can almost forget the hardware situation. It will take care of itself."

Software production is already a major national industry and yet no measures exist for evaluating the product, the manufacturers and the programmers, Frederic G. Withington, senior staff member of Arthur D. Little, Inc., said, echoing Steel's comments.

Asked by Afips to comment on the implications of its report to the federal government, Withington expressed his hope that government will take an active role in fostering the desirable growth of measures for software. He looks specifically for standards, particularly on documentation, and constraints on the ownership and movement of data — in and out of government.

Communications were not a subject of the Afips report but should have been, the Arthur D. Little staff member said.

The report was edited by Philip S. Nyborg, Pender M. McCarter and William Erickson.

Shown above, left to right, are Philip S. Nyborg, Pender M. McCarter and T.B. Steel Jr.

COBOL programmers . . .
Teach yourself structured programming

Everyone talks about structured programming, but nobody seems to do anything about it. From a programmer's point of view, I think that's a big mistake.

In my opinion, an outstanding programmer today must be able to design, document, code, and test programs using structured programming techniques. Although there is still debate about what the best techniques are, there is no doubt that effective use of structured programming can have a major effect on productivity

With this in mind, I'm happy to announce an important book on structured programming. It is called *Structured Programming for the COBOL Programmer*. As I see it, it is the first book or course that presents a method for implementing structured programming that is complete, logical, and practical.

This book is so effective that we sell it with an ironclad guarantee If you can't learn how to design, document, code, and test structured programs from it, you can return it for a full refund . . . no matter how long you've had it.

Once you complete this book, I think you'll enjoy programming more than you ever did before. Because Paul's method is so logical and orderly, you will be more confident and efficient than you were before. And many studies have linked morale with productivity.

What this Book Does

Like other books on structured programming, this book presents the theory behind the structured programming movement. Unlike other books, however, *Structured Programming for the COBOL Programmer* presents a complete system for applying the theory. In just six chapters, you will learn how to design, document, code, and test structured programs in COBOL.

In chapter 2, for example, you'll learn how to design a structured program. You'll learn the four steps for creating structure charts . . . what modules should go at what level . . . why there should only be one read or write module per file . . . the six things to watch for when reviewing a structure chart . . . how to number the modules in a structure chart . . . and much more.

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In the same way, chapters 4, 5, and 6 cover everything you need to know to use the remaining techniques for improving productivity You'll learn such things as what sequence to code the modules in . . . how to eliminate 77 levels from your Data Divisions . . . the one case in which a GOTO is required . . . how the paragraph names in the COBOL program relate to the HIPO diagrams and to the structure chart . . . when to use top-down testing . . . and how to code three different types of program stubs.

4 Reasons Why this Book is Effective

1. The author, Paul Noll, is a software specialist and COBOL expert. He is also responsible for the training of 250 programmers. As a result, his programming methods are superb, and his teaching methods are effective.

2. Paul never presents theory without showing its application. In contrast to other books and courses, this book is based around the development of four different kinds of business programs. Once you see how Paul's method is applied to these programs, you will forever see the value of structured programming.

3. This book presents structured programming in the context of COBOL. As a result, you will see all of the structured coding techniques in COBOL (and only COBOL). You will also see how design and documentation are related to the programming language used

4. This book contains dozens of illustrations taken from all phases of structured programming. You'll see structure charts and HIPO diagrams for each of the four programs developed in this book; you'll see structured COBOL, program stubs, test plans, and much more. In my experience, these illustrations, more than any other factor, determine whether an EDP course is effective . . and they are the missing ingredient in other structured programming books.

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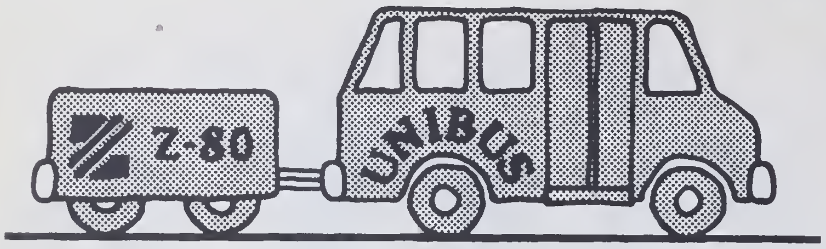

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Canadians Pass Law Protecting Data Banks

By Nancy French
CW Staff

OTTAWA — The Canadian government has passed a law to protect personal information in federal data banks — both manual and computerized — from abuse or misuse.

The data protection law is a small part of a general law that extends Canadian human rights and proscribes discrimination on the basis of race, national or ethnic origin, color, religion, age, sex, marital status or previous conviction for which a pardon has been granted.

Although it does not apply to records in the private sector, the act calls for a privacy commissioner whose duties include studying the advisability of applying the provisions of the law to nongovernment data banks.

The law exempts files from the reporting requirement if their publication might endanger international relations, national security and federal-provincial relations.

It also exempts agencies' personal records from access by individuals if those records would be likely to disclose information obtained or prepared by an agency in relation to national security, or in the course of investigations pertaining to the detection or suppression of crime generally or to a particular offense. In addition, the law exempts files whose publication might lead to harm to an individual about whom they have been compiled, reveal personal information concerning another individual, impede the functioning of a court or law established under the Inquiries Act, or disclose legal advice or other privileged communication between lawyer and client in a matter of public business.

Right to Consultation

The law gives each individual the right to be consulted before personal information given to the government for one purpose is used for any "non derivative" purpose unless that use is also authorized by law.

If agencies wish to use personal information for purposes other than those for which it was gathered, they must inform the individual in writing. If he does not respond in writing to the contrary within a prescribed time period, he will be "deemed to have been consulted and to have consented" to that use, the act says.

The law also requires that a designated minister in each department assure that his information banks are maintained in compliance with the law and that he prepare and distribute guidelines concerning that operation to various government institutions.

It also requires the minister to coordinate the collection, retention, use and storage of information in a manner that avoids unnecessary collection of information. He is charged with reviewing use and modification of existing information banks as well as proposals for new ones with an eye toward recommending termination of files that are underutilized or improper.

In addition to studying possible nongovernment applications of the law, the privacy commissioner will be responsible for receiving, investigating and reporting on complaints from individuals whose rights are denied under the law.

If the commissioner finds that an individual's rights have been abridged, he must give the appropriate minister a finding of the investigation with his recommendations, and where appropriate, a specified time period in which to implement his recommendation or to say why no action will be taken.

The commissioner is also charged with communicating his finding to the complainant or to his representative.

The commissioner will also file an annual report to Parliament on his activities.

The law becomes effective on a day to be "fixed by proclamation."

Users Centralizing Policy

(Continued from Page 8)

supplied by their vendors.

The manufacturing sector exhibited less of a commitment to a single vendor than did the commercial environment, because manufacturing's needs called for more single stand-alone processors "whereas the commerical environment often required equipment to be compatible with networks in place or soon to be implemented."

The users surveyed had systems covering the gamut of minicomputers and small business systems. Some of the vendors represented were Digital Equipment Corp, Data General Corp., Texas Instruments, Inc., Hewlett-Packard Co., Systems Engineering Laboratories, Modular Computer Systems Inc., IBM, Interdata, Varian Data Machines (but not Univac,) Honeywell Information Systems, Inc., Wang Laboratories, Inc., Singer and Datapoint Corp.

Large organizations made up of sophisticated users generally use independent peripherals more often than smaller firms, the report noted.

"As users become increasingly sophisticated in their use of minicomputers they depend less on the minicomputer vendors as their source of peripheral equipment," IDC reported.

The companies were most willing to buy independent terminals and printers. Disk pack drives, other peripherals and main memory were the next most likely purchases.

However, one large organization told IDC it used independent peripherals only when they were less expensive than what the vendors offered or when the required equipment couldn't be obtained from the vendor.

A majority of commercial users have made enhancements and adjustments to their installed systems over the last two years, the study showed. System and processor upgrades, increases in main memory, disk storage expansion, changes in storage media, changes in tape drives and the addition of terminals were common among the users.

Next week, one of the best-kept secrets in the computer industry will be revealed on these pages.

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Voluntary Data Protection Not Enough: ACLU

By Ann Dooley
CW Staff

NEW YORK — Information collected about an individual becomes a larger reality than the person himself, according to Aryeh Neier, executive director of the American Civil Liberties Union (ACLU).

Speaking at a panel discussion on personal records and their impact on employment, Neier said that although many companies favor self-regulation rather than privacy laws, individual privacy cannot be guaranteed without new laws.

Collecting information about people is a common practice and so, too, is judging people on the basis of that information, he told attendees at a three-day briefing entitled "Privacy Regulation: Implications for the Business Community," conducted here recently by the American Management Associations.

Neier

CW Photos by A Dooley
Farr

Employers screen out people by looking at their records before even seeing the individual, Neier said. This kind of procedure is necessary because it saves time for the person in charge.

"You people here have achieved a certain amount of success, there either is no damaging information about you or you have been able to conceal that information. But some people can't," Neier told the audience.

For example, although all arrest records become part of an individual's history, an arrest is not the same as a conviction and doesn't prove anything, he pointed out.

The federal government has estimated that 50% of all males have arrest records, he added. The statistics also indicate that 60% of all nonurban males and 90% of all urban males will have arrest records in their lifetimes.

Many of these people will manage to live as ordinary citizens, but some won't be able to escape the information recorded about them, Neier said.

This pariah population can't get useful employment and so becomes a danger to others by preying on them to survive. Neier said, adding that this population seems to be growing.

The FBI circulates 29,000 arrest records daily to government agencies, private investigative agencies and local law enforcement agencies, he said.

If privacy legislation were passed to restrict data collection, the risk for society would decrease even though individual places of employment may run a greater risk of theft or other type of crime, according to Neier. There would be less mugging on the streets, but perhaps more dollars lost by the company, he said.

Relevance is the issue, according to Neier.

As for medical records, the only information an employer should know about an employee's medical history is whether that individual is physically unable to do a particular job, according to Neier.

The Privacy Protection Study Commission should have leaned further toward legislation, Neier said. The commission said businesses haven't had a chance to see if self-regulation will work, but in fact they have had their chance, he added.

Penney's Files Open

Arguing for self-regulation, Charles Farr, personnel manager for J.C. Penney Co., said Penney's has already implemented many of the privacy commission's recommendations in the area of employment.

The company continually reviews its policies to make sure they meet the current legal standards in employment, he said. The company also polled its employees to see what they thought was important on an application form.

In response to their opinions, Penney's eliminated much of the requested health data, he said. Now the application only seeks to find out if there is any physical disability that would impair job performance.

Criminal conviction information is only requested if the job being applied for involves a position of trust.

Penney's also has a policy of personal access to personnel records, he said, explaining it is important for an individual to know where he stands with the company so he can change his behavior if need be.

It also gives him the chance to pick out any errors or make changes in the file, he added.

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—Jim Folts, Vice President, Terminals Division

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If Businesses Comply Voluntarily

Private-Sector Privacy Act Avoidable: Westin

By Catherine Arnst
CW Staff

NEW YORK — If businesses reexamine their personal recordkeeping practices and correct abuses voluntarily, the call for legislation at both the state and federal level will fade, Dr. Alan Westin, Columbia University professor of public law and government, told attendees at an American Management Associations briefing on privacy regulations and their implications for the business community.

"I'm not sure that legislation is inevitable ... it's not a prime issue at the national congressional level," Westin said. However, companies that voluntarily respond to privacy concerns will benefit in the long run because they will not have to change their systems later if legislation is passed, he added.

Privacy in this country has gone through three phases so far, he said. The years from 1964 to 1969 marked the "period of early alarms," which was "symbolically kicked off" by two books on information abuses — *"The Privacy Invaders"* and *"The Naked Society."*

Although early alarms weren't always focused on recordkeeping, the emphasis shifted to this area with the proliferation and visibility of computers, Westin said. Three assumptions became widespread and generally accepted:

- When an organization got a computer, it automatically started collecting more information.
- As more companies got computers, they would exchange information.
- More secret records would be kept.

Many feared the computer age had its own momentum — the machine was out of control and the capacity to stop it was lost, according to Westin.

Second Phase

The second phase, from 1969 to 1973, was dedicated to empirical research and was "all investigation with no action," Westin said. At that point one of the things learned from these investigations concerned the state of the DP art itself.

Automation was such an expensive process that it created its own safeguards; companies were reluctant to automate any but the most frequently used or critical data.

It was also learned that information tends to be a resource, and the computer only allowed companies to perform the same kind of information exchanges performed before, but more rapidly and efficiently, he said.

As for more secretive recordkeeping, the rules a company followed before it acquired a computer tended to be the same ones it followed afterward, he added.

Nixon: Patron Saint

Richard Nixon then became the "patron saint of privacy legislation" because Watergate caught the attention of the nation and highlighted the potential for information misuse, he said. After Watergate, no one had trouble justifying privacy legislation, he added.

Thus, starting in 1974, the third phase began — the phase of "initial regulation," as Westin called it. The first federal Privacy Act was passed in that year, but this law had been preceded in 1970 by the Fair Credit Reporting Act, which provided a tool for measuring procedural effectiveness and paved the way for the Privacy Act.

The 1974 act was also helped by political considerations — Congress owed retiring Sen. Sam Ervin a large debt for chairing the Watergate hearings and it also knew something relating to privacy protection had to come out of the 1974 elections, but it didn't know how far to go, Westin said.

Most legislative action was deferred until the Privacy Protection Study Commission published its report, he said. That report, issued last summer, did not recommend immediate legislation, but instead advocated that the private sector be given a chance to voluntarily comply with its recommendations.

There are now three positions that can be taken in regard to "what's next," Westin said. "We can stay with the status quo" and not pass any major legislation; "We can have rifle-shot legislation" aimed at specific critical areas; or omnibus legislation can be enacted with a complete code as a model for either the state or federal level.

Westin favors a federal omnibus law, but not until "as much good practice as can be counted on has taken place voluntarily in the private sectors."

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Credit Reporter Warns Against Privacy Laws

By Ann Dooley
CW Staff

NEW YORK — "If it ain't broke, don't fix it" is Jeff White's advice concerning privacy legislation.

Speaking at a recent American Management Associations briefing here on "Privacy Regulation: Implications for the Business Community," the group vice-president of Equifax, Inc. said consumer credit is responsible for the present U.S. standard of living and information is needed to assist in the decision-making process of granting credit.

Credit agencies must coexist with a government which is increasingly involving itself in business, White noted, adding credit companies must also coexist with the trends of inflation and consumerism.

The cry for government intervention to protect privacy is becoming more widespread; while the public guards its privacy, however, it also doesn't want to give up the benefits of living on credit, White said.

But some privacy must be relinquished in order for the businessman to make intelligent decisions, he pointed out. What must be found is a balance between the businessman's right to know and the individual's right to privacy, he said.

An individual can't have it both ways — complete privacy and easy credit — so fair information-gathering procedures must be established, he stated.

Congratulating the Privacy Protection Study Commission on its recent study, White said he agreed with almost everything in the report.

He did, however, object to the recommendation that "government mechanisms" be established to determine what data can be gathered. White warned the credit industry to be cautious before giving up to a government body a right so necessary to its work.

"If you can't see the end result, don't build it," he added.

The privacy commission also recommended that credit grantors utilize only those investigative credit agencies which comply with the commission's recommendations, White said. That seems to indicate the commission expects all its recommendations to become law and that each of its recommendations will be regarded as beneficial by the majority of people, he noted.

The commission made recommendations so an individual could decide logically about the use of his credit files, but failed to consider the dollar cost for the credit companies, he added.

Commission's Job

Since the Fair Credit Reporting Act was implemented, the credit industry has changed. Large companies like Equifax have become a dominant part of the market, and the commission decided to determine whether existing laws were adequate, according to Chris Heller, former privacy commission member.

To begin with, the commission reviewed existing laws to see if they were adequate or if new ones were needed to patch up the problem areas, he said.

The commission found the issues hadn't really been addressed the first time around, when they should have been, Heller said. It discovered consumers were interested in why they were denied credit, but it was difficult for them to find out the reason.

It's a "Catch-22" where an individual is shuffled between credit companies and investigative credit bureaus. Each tells him a little bit, but not what it means when it's all put together, Heller said.

Commercial credit "wasn't a tidy thing for the privacy commission to grapple with because it's a dynamic, changing industry," he said. But even though the issues were difficult to handle, they are fundamental, he added.

DP Curricula Slated As Workshop Subject

ORLANDO, Fla. — The IEEE Computer Society and the Association for Educational Data Systems will hold a workshop on new two- and four-year computer science and engineering curricula at the Sheraton Jetport Inn here. Slated for next February 2-3, the workshop will also deal with business data processing curricula.

Participants will be able to present short papers on topics like information science programs, analysis of curricula material and appraisals of data processing programs at junior and community colleges. Send three copies of contributed papers (double-spaced, two to 15 pages long) by Nov. 15 to Prof. David Rine, Information Science, Illinois University, Macomb, Ill. 61455.

Deadline for preregistration is Jan. 27. For more information, contact Harry Hayman, Executive Secretary, IEEE Computer Society, P.O. Box 639, Silver Spring, Md. 20901.

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Suggests Corporate Task Force

Privacy Nothing New, Lawyer Says

By Ann Dooley
CW Staff

NEW YORK — Concern over privacy is not a new issue, according to Marilyn Maledon, assistant general counsel for Rockwell International.

Privacy was brought up as a legal issue for the first time in a Michigan state court in 1868, when it was declared a constitutional right by Justice Thomas J. Cooley, she said.

In 1890, Supreme Court Justice Louis Brandeis ruled an individual had the right to be "left alone." The right to privacy was again upheld in the 1965 case of Griswald vs. Connecticut, which stated the right was protected under the first, third, fourth and ninth amendments, Maledon told an American Management associations briefing on privacy here recently.

No Definite Stand

The 1970 Fair Credit Reporting Act was the first time Congress addressed the question of privacy with regard to information, the lawyer noted. In 1976, however, the Supreme Court examined privacy from an information aspect and declared an individual has neither a legitimate expectation of privacy nor a "protectable interest" in his bank records in the case of U.S. vs. Miller, Maledon said.

More and more lawsuits are coming before the courts using an argument of right to privacy, she said. While the courts have no hard and fast viewpoint about what privacy is or isn't, it is generally agreed that individuals do have certain rights and that courts and legislatures will use a balancing approach, Maledon said.

Therefore, companies had better be able to justify the actions they take, she warned.

Self-Regulation Advantages

The advantages of self-regulation from a business standpoint include the fact that a company will be able to tailor its regulations to the organization's own needs, Maledon said. A company knows best how to put its own house in order — certainly more than a government that can only issue broad orders, she noted.

Voluntary cooperation also emphasizes an employer's concern over employee welfare, she said.

One problem with voluntary compliance is that an employer may go beyond the point of what is necessary, according to Maledon. In addition, this approach would leave employees with no place to bring their complaints outside of the company.

It is more difficult for an organization to enforce a rule when there is no legal obligation, she added.

In addition, some organizations would end up doing more than other organizations of the same type, which could end up being disadvantageous, she suggested.

Self-regulation does not mean doing nothing, Maledon said. Corporations should act as concerned citizens and have a firm, long-term commitment of social responsibility, she contended.

Corporate Task Force

Each business should establish a privacy task force tailored to the needs of the organization with top personnel participating, Maledon said. The task force should review existing policies and practices of data collection, maintenance, use and dissemination, she said.

The group should implement the recommendations of the Privacy Protection Study Commission and serve as a focal point for all privacy information matters within the company, the attorney suggested. It should also review external factors which may influence the company's policies and also promote awareness of the confidentiality of information within the company.

Before formulating policy, an organization should understand the difference between privacy, confidentiality and security, Maledon pointed out.

CW Photo by A Dooley

Marilyn Maledon

Policy could follow Department of Health, Education and Welfare (HEW) guidelines or the privacy commission's recommendations.

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Editorials

The Real World

While economists and lawyers drone on in New York, attempting to show IBM's power in the computer marketplace, that power can be clearly seen in the real world of systems announcements over the past few weeks.

By its price-cutting action with the announcement of the 3031 and 3032 processors, IBM established a new price/performance curve. Now all the mainframers are rushing to market products that are competitive.

The first reactions, of course, came from the plug-compatible CPU manufacturers, with Itel bringing out a new Advanced System.

But now Burroughs has jumped into the fray with the B6817 to compete against the 3031; Univac, too, has announced three machines to compete in the new marketplace.

All of these reactions are clearly related to the IBM products, and the firms involved admitted as much by making such comparisons in their press releases.

Clearly, this shows IBM's power to sway the market. Few, if any, react when Honeywell, Burroughs, Univac or NCR brings out a new series of mainframes, but all, or at least most, react when IBM does the price juggling.

Of course, this activity gives users more choices and potentially lower prices, but users always seem to have to wait for IBM to make a move before any of the other firms offer those options.

In a truly competitive industry, the other manufacturers would constantly offer product and price improvements and wouldn't wait to play "follow the leader."

Dema's Tough Job

The year-old Data Entry Management Association (Dema) recently held its first conference. The gathering drew over 300 front-line data entry managers and supervisors, the first time such a group has ever gathered under one roof.

Quite a bit of excitement was generated in the sessions and in the workshops, where the managers were able to discuss with each other the common problems and headaches of their profession. Turnover, training, motivation, vendor support and distributed data processing were the key phrases of the day.

Dema wants to assume the role of change-maker in the area of data entry. Its areas of concentration include education, standards, professionalism and attitudes.

Dema's goal is noble, but changing the attitude that data entry consists of "a bunch of girls on keypunches down the hall" will be no simple task. Such attitudes are deep-rooted and change is very slow to come. The same problem will be faced in the areas of certification and professionalism.

Yet, it is refreshing to see a professional group bent on making sweeping changes in its field, and hopefully the changes will come more easily than usual and the results will be satisfying.

It will be interesting to visit next year's conference in San Diego and see what changes Dema has brought about during its sophomore year.

Data Past

Five Years Ago
Nov. 1, 1972

WASHINGTON, D.C. — A study conducted by the Canadian Department of Communications concluded that although most people appreciated the benefits of computers in the economic and scientific areas, there was still a "latent fear" of depersonalization and loss of control over decisions affecting their personal lives.

— — —

WASHINGTON, D.C. — The Supreme Court reconvened hearings on the issue of software patents. Officials could not predict when a decision would be forthcoming in the Benson-Tabbott patent case.

Eight Years Ago
Nov. 5, 1969

NEW YORK — The Business Equipment Manufacturers Association's Plan and Policies Committee without warning dissolved the X3.4 Standards Subcommittee on Common Programming Languages.

X3.4 was created to allow users and other technically qualified persons a forum and the authority to exercise competent control over the progress of language standardization.

— — —

HAWTHORNE, Calif. — The Magne-Head Division of General Instrument Co. introduced the Diskstor 505, a fixed-head drive with a removable disk.

The unit used the Diskpac 005, a plated disk with a 5 million-bit capacity, and the Diskstor 500 disk drive. The disk drive could handle 8-, 12-, 16- and 18-bit words in parallel and offered an average access time of 8.7 msec, the company said.

'Warn't 'Nuff to Put a Roof on 'Er — Now They Want Privacy an' Security to Boot!'

Letters to the Editor

With 'Help' Like That . . .

I am a convict in a state penitentiary. This letter is intended to offer some personal input about the government criminal data systems.

My crime was one of unwarranted violence, about six years ago. I am due for release this winter.

About a year ago, I chaired an institution Jaycee chapter committee whose goal was to match individual releasees with an outside Jaycee chapter to ensure the ex-convict's success in resocialization. My work brought me in contact with several chapters, one of which eventually became interested in "helping" me. This chapter is 200 miles from my home town, where I committed "my" crime.

My wife was invited to a community meeting to introduce herself and to discuss the Jaycee program. This "high-rent district" chapter had its quota of doctors and lawyers, one of which worked in the local district attorney's office.

My wife arrived at the meeting to find that the lawyer (in a spirit of helpfulness) had decided to expedit getting to know me by ordering a complete criminal file printout and laying it open to the 50 members of the chapter and their families.

During later discussions with my wife, we determined the record incuded all arrests during my life; several references to incidents of which neither of us was aware; confidential psychological evaluations; and opinions of my character written by a prosecuting attorney preparing to bring me to trial in 1971.

Though the prison experience has helped me to not feel ownership of my body or "private" information, my wife, with a citizen's mentality, refused further contact with the Jaycee program.

As a side note, I became a computer programmer and worked through the mail to finance psychological therapy over the last six years, as well as contribute to my wife's support. I thereby "accidentally" became this state's first convict to get a college degree from inside the pen.

While I agree with the position that criminality does not belong in business data processing, neither does criminality belong in the community. The problem is to differentiate between humanity and criminality and selectively destroy only the latter.

(Name Withheld by Request)

Simple Language, Please

Just read Frank Binder's sophist clap-trap on education ["DP Education Worthless in Everyday Use," CW, Oct. 3]. Please print this letter to him:

Dear Frank:

Just read your dirge on schools. It shows quite well that you are bright, but it does not show that you can write your thoughts so we plain souls can tell what you mean.

Too bad you used our tongue that way. It is rich with phrase, verb and noun which give us all much room to state our thoughts so they are clear to all who read or hear them.

I teach and write in this field, thus make my way by means of speech and prose. I ask you, Frank, please tell me in short words what you have in mind. It might help me be sure I don't cause those who come my way to leave with such a bad taste as you have given me.

By the way, Frank, I tried not to sleep through your "school." I failed.

Nate A. Newkirk
Mt. Kisco, N.Y.

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Even DPers Can Be Replaced by Machines

By Jack Stone
Special to CW

It was at the semiannual conference of the Computer Management Association (CMA), a mid-October affair in Pittsburgh, that I met J. Bert Heuerman. As president of CMA, a Honeywell User's Group, he invited me to the meeting to speak on "Managerial Leadership."

His full-time job is that of administrative services manager for the Questor Corp., headquartered in Toledo, Ohio. As we chatted, we learned of our common interests in DP management development — he held forth with a management workshop as part of his strong commitment to this area.

One of the issues that came up in his workshop was general concern about the growing "impact of automation," (know the phrase?) upon the jobs of, if you can believe it, data processing personnel! Naturally, I pooh-poohed such thoughts, because I fervently believe in the heaven-sent law on the employment of DPers which states that the current universal need for our wonderful people will extend into perpetuity.

But after interviewing Bert, I'm frank to say that I was troubled with some nagging doubts.

Q: Bert, do you really feel that some DP personnel in computer centers will lose jobs over the long haul?

A: I really think it is inevitable that there will be a substantial reduction in these jobs in coming years. But as history has shown in other industries where automation has hit, those affected generally find jobs elsewhere. I believe that affected DPers will move away from the large centers into data processing activities which will undoubtedly grow in the user organizations or in vendor companies. And I can suggest some indicators that tend to justify my projections.

First, a number of my friends in large centers are beginning for the first time to think about broadening their skills and capabilities in anticipation of a future personnel crunch.

Second, the image of the centralized computing facility has been largely tarnished in the eyes of influential users and executive management. For example, I think that one of the major reasons for their mad rush into minis and micros has nothing to do with technical or economic considerations — they simply want their own machines to end the long-term communications problems they have had with the DP departments.

Third, there have been many developments in both the industry and the technology which, when all are viewed together, tell me that head count in a centralized operation simply has to fall.

Q: Would you give me some examples of such developments?

The Human Connection

A: Glad to. Turnkey software packages. The simple fact is that any DP manager worth his salt recognizes that he must seek out packaged software alternatives to counter increasing costs for in-house personnel. When outside software fits and the vendor can properly perform the maintenance function, the cost savings can be enormous. From one perspective at least, packaged software is automating the classical functions of development and maintenance programmers. Surely you can visualize how personnel growth in in-house DP departments will be stunted as the software market burgeons.

Here's another example. Let s examine what data base management systems (DBMS) are doing to the jobs performed by applications programmers. The DBMS makes it possible to vastly reduce the amount of programming effort required to support a major installation.

I recently heard of one very large operation, with hundreds of programmers, that made a study of what the programmers actually did. It turned out that only a small percentage of them used standard programming languages — the vast majority served the users by framing queries against the data base, a task that can be performed by lower skilled personnel.

Q: How do you think machine operations will be affected?

A: Competition is forcing the mainframe vendors to automate the production flow in every way possible. It is clear to everyone that truly low-cost mass storage is just around the corner. Everybody is thinking in terms of permanently mounted direct access facilities. What happens to the need for people to handle tape and disk mounts?

System reliability continues to improve as hardware maintenance becomes automated and as more of the operating system gets converted over to microcode. Shouldn't we expect a reduction in the need for in-house super-expert systems programmers and hardware debuggers?

And distributed processing systems surely will ultimately place job processing responsibility in the hands of the non-DP-oriented terminal user. What happens to the production control function?

Q: I can see some concerns about programmers and operations personnel, but certainly the analyst will always be there to perform his services on his appointed rounds.

A: Not so sure about that. Some day, if top executives have their way, systems development and operations will be performed using a uniquely generalized problem-oriented language — English!

Letters to Stone should be addressed to him at Suite 222, 2233 Wisconsin Ave. N.W., Washington, D.C. 20007.

One Person's Ethic May Be Another's Ploy

The Taylor Report
By Alan Taylor CDP

Bill Getz, the General Services Administration's commissioner for data processing for the western parts of the U.S. and a well-known author, has come up with a reason for the many split answers given to questions on DP ethics in the recent SRI International workshop on ethics. The answer, he tells me, is that "one person's ethic is another person's ploy."

Unfortunately, Getz did not explain in detail why he reached this conclusion, or give any examples. However, listening to the discussion that went on at the Data Processing Management Association (DPMA) conference last month when Donn Parker reported on the SRI workshop, I could fairly clearly see what he meant.

Consider the question of program ownership, for instance. If a programmer personally develops a tool that no one else uses, can he take it to a new employer? Must he leave copies with the old employer if he does so? The workshop split on this problem — as did both the National Computer Conference and DPMA audiences.

It cannot be expected otherwise. Some who know what the law of the land is and how few property rights exist for programs will be inclined to recognize this by considering what legal right the old employer had to complain about the treatment he had received — which amounts to little or none.

Those who see themselves in the employer's position may feel wronged because manpower and machine time went into developing the "tool," and they feel entitled to the fruits of such labor, either exclusively or together with the new employer.

Others, feeling for the employee's position — not being asked to leave his private programs behind and not being offered any compensation for doing so — may feel that the employer's failure to take any action to obtain such programs is enough to put the employee in the clear.

In fact, each participant could come to a black or white conclusion based predominantely upon his particular view as to the rightful place of employer and employee.

Ethics Council

Getz, who is also the Society for Management Information Systems' (SMIS) ethics chairman, has come up with a preliminary proposal that an Ethical Standards Council be formed, consisting of about 25 to 50 representatives who would vote anonymously on selected questions and then have their voting records published. Not all votes would be taken by the full council, with some smaller groups of seven or nine normally being used.

The ethics council is certainly an interesting concept, and readers who are interested in supporting or developing it are invited to contact Getz at 105 Braemar Drive, Hillsborough, Calif. 94010. Personally, I think there is too much anonymity built into it, and while not against such an organization as a long-term solution, I still feel there is too much foot-dragging going on. Such time-consuming solutions are leaving the present generation of DPers without proper guidance.

Point of Agreement

As a test of my concept that we already have quite enough knowledge to start work with, I asked the DPMA audience the same questions from the SRI workshop, but added one significant variation: that the actions were, in fact, illegal, and that dissolved the split.

Whether or not the programmer knew that it was illegal, just about everyone — led by Donn Parker himself — voted that illegal actions were unethical. So our first two ethical and professional principles are already established and waiting to be worked on. As long as they are being ignored while "further research" is being conducted, the blame for prolonging the current ethical situation must, in my view, fall squarely on the proponents of "research first, maybe action later."

It is clear that DP people are simply uninformed as to what the law is — even as it applies to matters with which they work every day. For a professional to be and to remain so uninformed is unethical. It is simply being reckless in an area when others are involved. So, some means is needed to see that professionals know the law and know current ethical questions.

For professional organizations, such as those in the SMIS orbit, it would mean checking that employees are never put unnecessarily into the grey areas described by the SRI workshops' questions. Any DP organization that fails to define its precise rights and those of the professionals and the public with whom it deals should be understood to have protected all legal rights of third parties and surrendered all its own rights not explicitly and properly reserved.

Any DP organization that attempts to indirectly obtain rights not its legal property should be considered unethical and acted against accordingly.

The immediate acceptance and publication of these simple ethical items is the task at hand.

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Letters to the Editor

U.S. Didn't 'Win'

I would like to take strong exception to your coverage of the recent transborder data flow and privacy symposium held in Vienna, Austria [CW, Oct. 3].

As a member of the American information industry represented at the symposium, I must say that in no sense did the U.S. "win." Indeed, to broadly characterize the event as a "battle" where the U.S. group "pressured" a member of the Austrian government to "soften" his closing remarks only adds to the perception expressed. by many of the countries' delegates that the U.S. information industry considers Europe a single extension (a 51st state) of the U.S. market with little regard for cultural and social differences.

American presence was certainly felt at the symposium via personal contact and excellent papers presented by our representatives, but papers and viewpoints made by many other of the 250 participants from most of the other 23 Organization for Economic Cooperation and Development (OECD) member countries — representing views such as ours and those vastly different — also had an impact on the symposium.

As an indication of just how we "won," it is understood that the committee of experts of the Council of Europe met (as scheduled) in late September after the Vienna symposium and has indicated that an international agreement concerning "data protection" will be enacted within two years [CW, Oct. 10].

Many symposium participants from different nations felt that two years was not enough time to properly study the matter so that the interests of personal privacy are kept in proper balance and in harmony with economic and free trade interests.

The OECD background document on the symposium as well as the speeches of various members of the delegations noted that the symposium was expressly intended to offer a forum whereby interested organizations and individuals could listen to diverse viewpoints and plans regarding the subjects of privacy and international data flow. It was my impression from all that was said that no one intended that the symposium would bring forth a firm resolution or action and this was, in fact, what happened.

For example, in the opening statement of G. Eldin, OECD deputy secretary-general, he made it clear that "no one expects this symposium to provide a complete solution ... There is reason to hope that it will constitute an important step toward clarifying those problems ... Members of the data bank panel ... are here to listen to you."

In summary, the sad truth is that U.S. industry has been caught with its pants down in this issue of privacy and the impact on its information sector in the world marketplace, and this symposium was the first time we have really been heard on an organized international basis.

We have many more steps to take to ensure a viable place in the future for our information products and services in other nations. Concerned firms should pressure our government to take a greater interest in this area and they should encourage citizens of other nations to contact their respective government entities in the interest of economical free flow of data across national borders.

Scott I. Brear
Santa Monica, Calif.

What About 'Float'?

Alan Taylor, in his column of Oct. 3, apparently made every effort to demonstrate to the world his lack of even an elementary knowledge of the banking system in the U.S. He questioned the payment to accounts in Chicago from banks in New York, intimating that, somehow, there is a moral/ethical problem with doing so.

Have you ever heard of "float," Alan? Probably three-quarters of the people with checking accounts use it on a regular basis when they make a payment by mail on Wednesday knowing that their account won't have the money in it until Friday.

He also notes that " . . . essentially, the application was inconveniencing some other, outside people to their financial detriment." It escapes me who these "outside people" could possibly be. Take my word for it Alan . . . Feel free to sleep tonight. There may be ethical problems around that are impacted by the DP industry, but this isn't one of them.

Paul J. Wilczynski
Randolph, Mass.

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Voyager's Minis Made No 'Decisions' Alone

Reader Commentary

By Terry W. Loar
Special to CW

The article entitled "System On Board Voyager Takes Its Cue From '2001' " [CW, Sept. 5] was replete with erroneous and distorted information. It also conveyed to the reader the impression that the Voyager spacecraft made real-time decisions contrary to the mission design. This is simply false.

We at the Jet Propulsion Laboratory (JPL) use very conservative and reliable design techniques with regard to our computer subsystems and their interaction with other spacecraft subsystems and the ground data system. The computer subsystems on-board Voyager are relatively simple and straightforward in their design and function.

There are no grounds for comparison between these computers and HAL. The Voyager computers are real and they employ accepted computing technology; HAL is fictitious and not feasible, given the current state of the art.

Three Subsystems

There are three subsystems onboard Voyager which use computers, and each consists of two redundant minicomputers. The Flight Data Subsystem (FDS) has the responsibility for collecting and formatting scientific and engineering data from other subsystems and sending that data to Earth. It is also used for controlling the scientific instruments.

The Articulation and Attitude (not altitude, as the article stated) Control Subsystem (AACS) keeps the spacecraft at the correct flight attitude by using celestial (the sun and the star Canopus) and inertial (gyroscope) references.

The Computer Command Subsystem (CCS) is an interrupt-driven minicomputer; it is the main computer and it performs two major functions.

First, it accepts scientific and engineering commands from Earth and stores them for future or immediate issuance to other subsystems. Second, it responds to interrupts from other subsystems which indicate significant events, some of which may be anomalous.

In the case of an anomaly, the CCS uses algorithms (which have been designed by humans and which are very well thought out) to determine the problem and to issue commands to work around the problem, e.g., to use redundant equipment.

The article alludes to the computer deciding that it "knew better than its human operators," that it "refused orders" and that it "took over control." I guess that the main computer (CCS) would be the culprit, if it were indeed possible to do those things.

This computer is identical to the Viking Orbiter computer. It is a 4K machine with 64 interrupt and level lines as input and an 18-bit command register (output unit) as output.

About two-thirds of the 4K is dedicated to flight software which does not change; the remaining third is used to queue up commands for future issuance.

There is no artificial intelligence or robotics involved and the computer does not have the ability to learn, nor does it have access to any auxiliary or mass storage.

The commands stored in memory are issued at precisely the correct time, with millisecond accuracy. These commands are simulated on the ground before they are transmitted to the spacecraft, and the ground controllers can observe differences between the simulated and the actual events, if there are differences.

There was, in fact, a maneuver abort during the first phase of the Voyager II mission, but it in no way can be attributed to a "failure" to follow "directions from the command center" or a "failure" to order a maneuver. In fact, it did precisely what it should have done — it put itself in a posture which precluded damage.

The capstone to the article, which caused many chuckles at JPL, was the statement that, somehow, the size of the spacecraft's antenna is related to the time that it takes a radio signal to reach Earth from Jupiter. Radio frequency energy is transmitted at the speed of light and is independent of antenna size. It is like saying that a smaller antenna at a radio station will cause a delay in the program.

The telemetry is not processed on a Univac 1108 as stated in the article; it is processed on Univac 1530s, 1219s and 1218s.

The U.S. space effort is currently experiencing a dearth of funding. The last thing we needed was an article which implied the incompetence of the designers and emphasized the apparently mysterious aspects of high technology.

Loar is computer command subsystem lead engineer for the Viking mission at the Jet Propulsion Laboratory in Pasadena, Calif.

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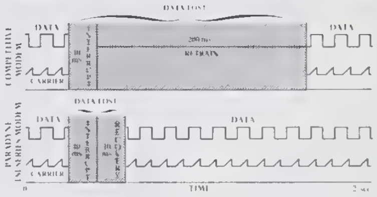

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ACM Panelists Disagree

Very Formal 'Specs' Praised, Panned

By Don Leavitt
CW Staff

SEATTLE — Panelists at the recent Association for Computing Machinery conference here disagreed about the amount of formality that should be used in setting the specifications for a software system, but not about the basic need for "specs."

Panel chairman Anthony Wasserman of the University of California at San Francisco opened the session on the evolution of specifications by noting that specs describe what a system is to do, rather than how it is to do it.

They provide a description of a system that fulfills a set of user-defined requirements and set the stage for the detailed design phase, Wasserman explained.

Although specs may be general or detailed, formal or informal, the professor said, recent trends are toward formality of system description and increased user involvement at this part of the software life cycle, apparently to ensure that what is proposed is really what the user wants — in detail.

There are multiple views of the system description, Wasserman noted, including a user view "for the person who needs the system but who isn't interested in algebraic notations," a program structure view which shows how to decompose a large problem into manageable pieces; and a "correctness" view to be sure the end product does what specs said it would.

Wasserman said he feels there is a need for both formal and informal specifications, but John Guttag of the University of Southern California disagreed.

Guttag argued that "informal is inadequate" since designers must know exactly what the specifications define. They must also have some objective measures of the completeness and consistency of the end product, he said.

Overly complete specifications are also dangerous, he noted, since they may include a number of features which designers can implement, but which are not really essential in the view of the people who requested the system in the first place.

Guttag said there are generally two classes of specifications. The models class include program text, mode modules created with unique specification languages and denotational semantics.

The axiomatic class encompasses "Hoare axioms," conditional equations and predicate transformers, he added.

In the future, he suggested, there may be combinations of these two classes such that specification writers might "translate user needs into some model domain and then use axioms within that domain."

For his part on the panel, Larry Robinson of SRI International asserted that design specifications should be associated with a mode of computation, should restrict the system that can be specified and should help to manage the complexity of the development effort.

All specifications should be formal, Robinson said, although informal specs can be used as motivational tools and nonprocedural specifications are helpful, too.

Formal specs lead to better designs, Robinson contended, noting this generally means more time is spent on design and the work is more difficult than the coding and other implementation efforts — but it's worth it, he said.

Stephen N. Zilles of IBM Research, San Jose, attempting to play the part of heretic in the discussion, said, for example, that formalism is not the only answer in specifications and then spelled out various difficulties with formal specs.

The difficulties, he said, are that formal specifications are not always attainable (since few people have the necessary math training), not always necessary (since some errors may be tolerable) and not always desirable.

Informal specs may be stated in terms that are more familiar, more readable and more concise in the view of the end user, he noted.

Users Must Accept Limitation Of Software License: Attorney

By Esther Surden
CW Staff

SEATTLE — Users — and not just their managers — should know the details of any software licensing agreements their organizations have signed, an attorney specializing in the field told a group at the Association for Computing Machinery conference here recently.

Failure to live up to the terms of the agreement could lead to withdrawal of the software by the vendor, Stephen Hollman, general counsel of Optimum Systems, Inc., warned. A license is a right granted to the user and a user who goes beyond the details of that right is using the software illegally, he explained.

Typically, the licenser will send a copy of the software on some medium to the person who is going to use it, regardless of who signed the agreement. The person who receives the software sometimes has never even seen the agreement, but that license can limit the user in such things as taking the software to a backup machine or making more than a set amount of copies.

Most vendors protect their software by treating it as a trade secret, Hollman noted. For example, if XYZ company allows a computer center to use a particular piece of software and that user makes what the vendor feels is an excessive number of copies of it, a court will look at four factors to see if that secondary distribution was illegal.

First, it will ask if the basis of the software is generally known or something only the vendor and the user knows. Next, it will ask what measures the vendor took to guard its secrecy.

Third, the court will want to know the value of the software to both the user and the owner, and finally the court will want to know how much money was spent developing the software.

Coverage Gaps

Some licenses have gaps in coverage for the user between the time that a new version of the system comes out and the time the user can accept the new version, Hollman continued.

There is no "good way" to police software, he added, but "I think there will be more policing."

Software taxation is another area in which users can find themselves in trouble, he noted. "You may find yourself with a large retroactive assessment" if the vendor has inserted a clause in the agreement making the user liable for taxes the vendor felt were illegal and therefore didn't pay over the past several years."

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LOS ANGELES — Two of the nation's largest title insurers believe they have found a way to gain better control over one of the most important aspects of their business, their cash flow.

A cash reporting system run from within United California Bank (UCB) enables Title Insurance and Trust Co. and Pioneer National Title Insurance Co. — both Ticor, Inc. subsidiaries — to receive information on the financial activities of their 140 branch offices throughout the U.S. the same day they occur.

The results are lower operating costs, increased accuracy and better control of the operation, according to Robert Sena, treasurer of the Ticor title insurers.

The companies use the system — designed by Rapidata, Inc. and run on that network's facilities — to transfer the daily deposits of each branch into concentration accounts at UCB here in Los Angeles. The system also reports disbursements on both a daily and historic basis and keeps track of accounting cycles, allowing Ticor to track the performance of each branch.

Before the system was installed, according to Don Perez, manager of branch accounting for Title Insurance, "each branch phoned this data into the home office, where it was manually transcribed, then keypunched for use by the in-house computer system. Transfer checks and management reports were prepared the next morning."

Now, however, the entire procedure is faster and more simplified," Marty Wool, assistant treasurer of Title Insurance, explained. "Each local office accumulates the required information on specially coded forms as it becomes available. They report this data any time between 7 a.m. and 4 p.m. by calling a local or an '800' number on their own push-button telephone and 'conversing' with Rapidvoice, Rapidata's voice response system."

Two features of the system ease the input of data. First, the spoken messages of both Rapidvoice and the caller are printed on coded forms. Secondly, the caller may choose either a "novice" mode, which repeats each entry, or an expert mode, which acknowledges each entry with a beep. The caller finishes by entering a hash total which is verified by Rapidvoice.

If an office discovers an error or receives additional data, a second phone call allows additions or corrections to the original data. A "back value" feature permits data to be entered for dates up to 30 days prior to the date of the call.

At 4 p.m. each business day, the system automatically stops collecting and starts processing the data. Several minutes later, it is ready to transmit the information directly via Rapidlink, Rapidata's computer-to-computer software line, to the in-house computer systems of Ticor and UCB.

Depository transfer checks are issued by UCB and financial executives of the Ticor Title Insurers can receive and analyze reports on financial activities before the close of that business day.

Dry Run

"Training field personnel unfamiliar with computers to use the system could have been difficult," Perez said, "but a novel approach eliminated many problems before they occurred."

A special training file containing a "dry run" of the input procedure was developed. Each office was then given time to practice dialing into the system and entering data using this substitute file.

The home office monitored this file to measure each office's progress in learning the system before switching the office over to it.

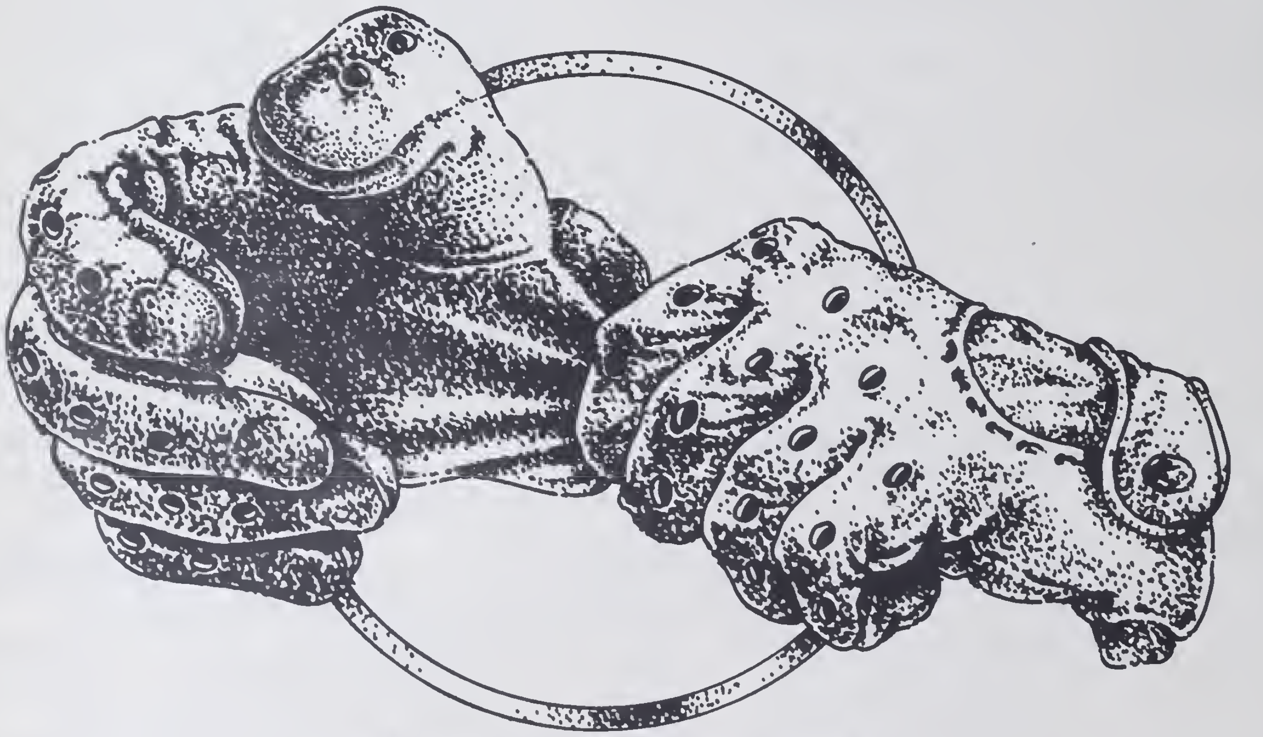
The entire reporting system is programmed in X2C, Rapidata's data management language. Because X2C collects more of the needed information in just one pass of the data, it reportedly results in fewer disk seeks, less processing time and less cost.

The entire system works on a time basis which permits certain operations to be performed only during specific time periods. The transactions are automatically written to two files on different disks. This creates a backup file which ensures that data will never be lost.

As a further safeguard, the main disk is switchable, allowing it to be attached to a second computer system if the first should ever become inoperable.

This combination of accuracy, efficiency and reliability has made this system an important asset to the Ticor insurers and their customers, Perez noted in conclusion.

Data Base/Data Communication



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'Itrac' Supports Transactions Run on Interdata 32-Bit Minis

OCEANPORT, N.J. — A software package that brings transaction processing capabilities to the Interdata, Inc. 32-bit mini line has been introduced by that firm.

Dubbed Itrac for Interdata Transaction Controller, the package features Cobol compatibility, interactive screen formatting and on-line screen form testing capabilities.

Designed for use both by OEMs and "IBM mainframe offload sites," Itrac was described as a product that "enables the programmer to focus on the details of his application."

The interactive screen-formatting feature allows Itrac to be "quickly" implemented by new users, the company claimed. A typical screen format takes about 10 minutes to design, Interdata said.

The screen design process starts when a user types a screen on the CRT in the format he wants. Data entry fields and user prompts are "marked" with a special keyboard character.

By hitting a "Send" key, the screen face is then sent to Itrac, which responds with a series of interactive, fill-in-the-blank screen forms. The forms solicit information for input data validation when the system is put in service, the spokesman explained.

An on-line testing feature enables the screen form to be tested before use. A utility called Modify allows specific changes to be made without affecting the entire screen.

The monitor works with any Interdata 32-bit processor that can accommodate 192K bytes of memory, a 10M-byte disk and one or more Model 1200 CRTs.

Minimum software includes the OS/32 MT operating system, Interdata's telecommunications access method and Cobol with Isam.

Itrac costs $6,500 from Interdata at 2 Crescent Place, Oceanport, N.J. 07757.

DEC CPUs Back Word Processing With 'ADMS'

SAN FRANCISCO — Word processing as well as DP capabilities are available to users of Digital Equipment Corp. Decsystem-10 or -20 mainframes who install the Automated Document Management System (ADMS), according to the vendor, Adapt, Inc.

With the package in place, users can manage an unlimited number of large and small documents interactively, a spokesman stated. Justification/hyphenation, automatic page makeup and page size flexibility are among the major features, he said.

Other word processing/text formatting capabilities supported by ADMS include footnoting, galley or page proofing and automatic numbering. Output options include photocomposition, typewriter terminals or microfilm, Adapt noted.

ADMS is "perfectly suited" for interfacing with current DP applications and such combined operations "will not greatly reduce" the total power of the CPU, the spokesman added.

He claimed initial users had prepared and phototypeset telephone directories, insurance forms and manuals, legal publication indexes and catalogs.

Others have used the package to prepare brochures and proposals, manuals, regulations and letters, he added.

The software functions under Tops-10 or -20 operating systems and is available now for $15,000 plus the cost of training the user organization and adapting the software.

Adapt is at 450 Sansome St., San Francisco, Calif. 94111.

Multifile Tapes Handled

NEW YORK — The ability to control each file on a multifile, multivolume tape library as an individual data set in a catalog is said to be the most significant feature built into Dynam/T, the DOS-DOS/VS-oriented tape library management system recently announced by Computer Associates, Inc.

The system performs automatic volume recognition (AVR) operations for any file on a multifile volume or volumes; having found the right file, Dynam/T positions the read/write head over the start of the file, regardless of what tape drive it is occupying, the vendor said.

Dynam/T logs exceptional occurrences for audit trail and accepts alphanumeric volume serial numbers, a spokesman noted. An early device-release feature permits immediate use of a tape drive by another partition and provides automatic release of tape-based sort work files.

The package supports control of an unlimited number of tape volumes and an unlimited number of tape file generations. It also provides reports on all tape activity.

Dynam/T can be acquired for $5,000 under a one-time license, but lease plans are also available, he said from 655 Madison Ave., New York, N.Y. 10021.

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Remote DBMS Monitors Multisite Cash Flow

Special to CW

MIAMI — From one small hamburger stand in 1954, to 1,877 modern restaurants and a $900 million-a-year business in 1977, Burger King Corp. has operated under principles of high quality, fast service and reasonable prices.

Dick Martin, director of planning and reporting for the wholly owned subsidiary of the Pillsbury Co., said today's competitive economic climate dictates a sophisticated data base management system in order to operate within budget parameters and ensure firm financial control.

"We have to know who spent what where," Martin said. "And the time when bookkeepers with arm bands and visors could efficiently handle our requirements has long passed."

That's why General Electric's Mark III remote computing service was selected to provide the DP power needed to handle the company's burgeoning capital budgeting and planning operations. Like most fast growing and successful companies, Burger King has to know exactly where its cash is going.

So in 1976, Burger King, in search of a sophisticated financial control system, turned to GE's Data Management System (DMS) for help with its financial control. DMS provided Burger King with the tools it needed then at a reasonable cost without unacceptable time delay, Martin said.

"But we needed more than that," he added. "We were looking for something with built-in flexibility, something that would grow as we grew."

Growth was indeed an important consideration in searching for the best system. Consequently, when GE introduced DMS II, an expanded data base management system, Burger King took advantage of the offering to upgrade its system.

"Since DMS II is upwardly compatible with DMS, very little time or effort was spent in making the changeover," Martin said.

This meant restaurant and department-level managers reaped benefits of the improved computerized system without being burdened with additional reporting tasks, Martin said.

Martin's operation is responsible for approving capital expenditures and the resulting cash flow of restaurants owned and operated or leased by the company and post-completion audits comparing projected and actual results.

In addition, similar financial data is maintained on the company's two service divisions, Distron and Davmor. Distron provides the restaurants with food and service-related products, while Davmor manufactures and distributes kitchen equipment and restaurant decor.

"In all, we have access to any of nearly 60,000 data elements literally at our fingertips," Martin said.

Basically, Martin uses DMS II to inform upper management of where each restaurant stands in relation to its approved budget, both in cash and financial worth.

Each month, input received on a weekly basis from the company's Real Estate and Operations Department is weighed against investment costs. Each restaurant's first three year's sales record, for example, is plugged into the data base and compared with projections, Martin said.

A restaurant's sales must reach and maintain a certain predetermined relationship to investment to achieve projected financial goals, he added. Thus, using an abundance of information related to sales and capital expenditure levels gathered by the company, Martin uses DMS II to perform a running analysis on this relationship.

In addition to the company's upper management, 175 managers responsible for departmental budgets receive monthly reports. Such reports contain information ranging from initial budgets and approved additions to actual spending and budget overruns.

Eventually, 20 separate monthly reports will be generated by the data base for the company's various financial planning purposes, Martin said. Through these reports, Burger King management is aware of such variable cost factors as land, equipment, building maintenance and landscaping and their impact on the company's investment.

DMS II is especially suited to operations such as Burger King's where multiple reports are required. Since more than one type of report can be generated in a single pass of the data base, Martin's operation saves both time and processing costs, he noted.

In addition to monthly reports, one-time reports are derived through the DMS II ad hoc retrieval capability.

Martin cited several reasons for using DMS II, but simplicity of operation and flexibility were major strengths.

"My people who had no previous knowledge of computer systems and terminals quickly learned how to use DMS II," Martin said.

Another strongpoint of DMS II, according to Martin, is its interface with other GE systems. For instance, Martin uses Plot, GE's graphic display software package, and Fal II, its financial analysis language, to project restaurant construction costs by geographical region.

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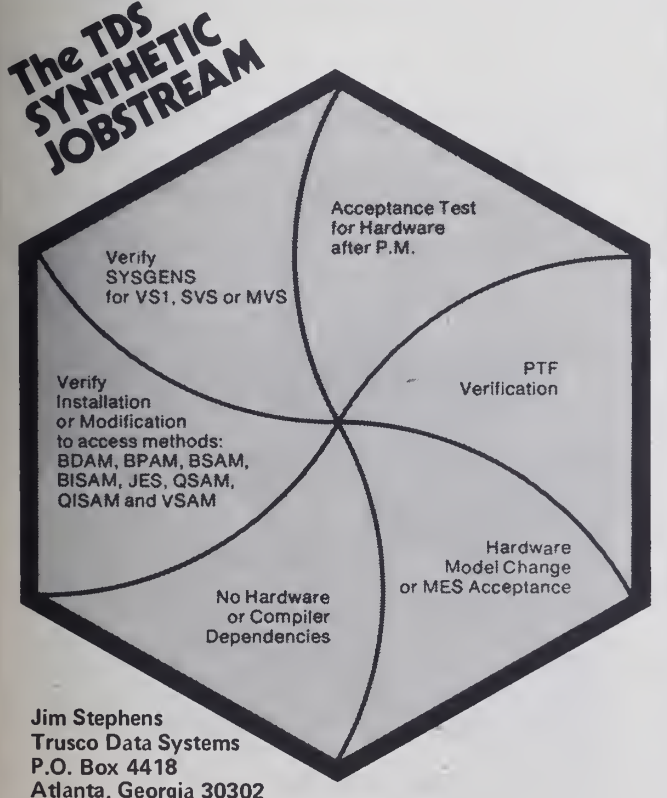
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Unit Moves Gradually to Data Base Integration

By Thomas Whalen
Special to CW

ANN ARBOR, Mich.— The Michigan State Housing Development Authority (MSHDA) is a state agency that furnishes low-interest mortgage money to provide housing for persons with low or moderate incomes. In order to carry out its operations and to answer legitimate requests for information from interested private and governmental entities, MSHDA keeps computerized records on multifamily housing developments, on residents of these developments and on borrowers in its single-family housing programs.

During the spring of 1974, the agency's changing needs required a revision in the contents of the Resident Profile System, which maintains demographic statistics on residents of multifamily housing developments. At that time, all of MSHDA's DP systems were conventional file processing applications run on ADP-Cyphernetics' Decsystem 10-based time-sharing service here in Ann Arbor.

However, it had become apparent that much of the utility of the Resident Profile System centered around special-purpose reports which were frequently needed on short notice. Much of the data for these reports was extracted manually from monthly printouts produced by the existing system; rush programming jobs were frequently required for the remainder.

This was expensive both in direct costs and in the disruption of other tasks by the rush jobs. In addition, the regular production of detailed demographic reports "just in case we need some of it" raised serious issues of privacy protection.

For these reasons, the agency elected to use System 1022, the data base management sytsem (DBMS) offered through Cyphernetics. The implementation went relatively smoothly. The

(Continued on Page 28)

Service Depends on DB/DC Combination

MINNEAPOLIS, Minn. — The sophisticated use of an integrated data base/data communications system by a small firm serving major U.S. "dealer banks" in the management of their bond portfolios is an example of the degree of specialization that is becoming more and more evident in DP applications.

"Almost all our customers have DP capabilities far more sophisticated than ours," Ed Warrington, president of Warrington Associates, said. "They utilize our service because it is better and more cost-effective."

Warrington Associates provides processing services and markets software products exclusively to bond departments of major commercial banks throughout the U.S. Formed in 1967, today the firm employs 16 persons.

At the outset, the firm did contract programming. In 1969, it began selling bank packages and in 1974 started providing its bond trading services to banks.

"We limit our customers to bank investment divisions," Warrington said. "We do portfolio processing, customer safe-keeping processing and bond and money market trading."

In explaining the importance of data base management systems (DBMS) and data communications software, Warrington pointed out there are only 200 or so "dealer banks" in the country that can utilize his firm's services. These dealer banks have bond departments or investment departments that do three things: buy and sell and trade on bonds and money market instruments; safe-keep these securities for their customers; and handle their own bank portfolio and assist other smaller banks in handling their portfolios.

"What we've done," Warrington said, "is automated this entire procedure. Even though these banks all have their own DP capabilities with set-ups far more elaborate than ours, they still rely on us because it's cheaper and better for them if they handled it internally."

In the Warrington operation there are two IBM 360/50s, each with 512K. A third IBM 360/50 is on order. One of the mainframes handles the on-line processing and the other is used for backup. Current volume at Warrington is 40,000 transactions per day.

Because data base management and data communications software is es-

(Continued on Page 28)

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User, Vendor Create DBMS

File System Handles Varied Types of Records

By Paul Teicholz
Special to CW

SAN FRANCISCO — Guy F. Atkinson Co., an international civil engineering construction company, was faced with a common dilemma of a medium-size DP user — what to do about data base for the present and the future.

For the last six years, the company has utilized an in-house conceived and constructed data base approach for all commercial systems development. This data base consisted of two types of files: a variable length Isam file for master records and a direct access chain file for transaction or detail records. Detail records are chained to each other. and to a master record of the same key with forward and backward direct address pointers.

All access to the data base from an application program is through a CALL to a common access module that performs the appropriate data base function and hands the results back to the application program. This data base access module (Dbam-designed and developed in-house) has facilities for record compression and, operating in a "test" mode that displays records on the printer rather than updating the data base, permits testing with live files.

This combination of software allows efficient use of data base files, but has caused increasing problems as on-line systems were developed, as the size and complexity of requirements increased and the inherent weaknesses of the file access methods surfaced.

In addition, like most Isam files, performance degraded rapidly when multiple additions were made in one area of the master file. The need for additional security, more flexibility in accessing records (alternate keys) and faster performance led to the search for alternatives.

The requirements were straightforward: The existing CALL interface and Dbam functions had to be supported; the performance on a 370/-135 DOS/VS system had to be at least as good as the existing system; the new system had to be a frugal user of system resources; it had to be able to function concurrently in multiple partitions and on-line under a teleprocessing monitor (Task/Master from Turnkey Systems) with complete data integrity and password security; it had to support a flexible and efficient method for processing master records via alternate keys in addition to the existing hierarchical requirements; and it had to be easy to learn and use by application designers and programmers.

Narrowing Choice

Several existing file management and data base systems (Vsam, DL/1, Adabas, Total and IDMS) were extensively evaluated over the past two years, but were rejected because of performance restrictions on the existing hardware, difficulties in supporting the existing data base file structure, inability to maintain the existing CALL interface and high financial and/or resource costs.

Finally, a file management system called the Input/Output System (Iosys) from Jeffrey L. Walker & Co. of Mill Valley, Calif., was selected after a thorough and extremely successful benchmark against the existing data base. Iosys supports both keyed and sequential files.

Efficiency of all file addition, maintenance, update and retrieval functions is excellent (from 10% to 60% faster than the existing system, 25% to 50% faster than Vsam). Insertion of records into the file is done so that processing degradation does not occur and reorganization is unnecessary.

Additional Features

Jeffrey L. Walker, whose primary business is DP consulting, then agreed to define and implement additional data base features for Iosys. These included multiple key access (file inversion), interface with Task/Master, additional security and a data dictionary.

The inversion capability allows selection of those records that are to be accessible by an alternate index and versatile construction of the inverted keys. These enhancements are implemented through a functionally similar Dbam so that complete independence is maintained between the application program and the data base software.

Teicholz is manager of the Systems and DP department at Guy F. Atkinson Co.

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See Computerworld's Microcomputing Classified Exchange on page 48 for details.

Michigan Unit Takes Slow DBMS Approach

(Continued from Page 26)

problems encountered were chiefly concerned with collecting the new data required by the agency and integrating the update process into divisional staffing and operations. Relatively few problems resulted directly from the transition to DBMS per se.

The system performed as expected in greatly enhancing and simplifying the production of ad hoc reports and eliminating the need for monthly general printouts. However, the large volume of additions, deletions and corrections each month led to update costs which were substantially higher than anticipated. Thus, although the agency remained committed to the data base concept, the systems group began a search for a more cost-effective way to obtain the benefits experienced with the 1022.

Pilot Project

In early 1975, Cyphernetics was apprised of the situation and it offered to make MSHDA a pilot application for a new DBMS called Information Processing Language (IPL). As in any pilot project, there were some temporary difficulties with various new features of the language, but these were all corrected soon after being discovered.

On the whole, IPL resulted in equal or better report generation and a substantial decrease in update costs ["DBMS Language Ups State Agency Efficiency," CW, March 14]. The main disadvantage was the loss of host language capability, but the power of the self-contained IPL language has largely eliminated the need for a Fortran or Cobol interface.

The MSHDA systems group has been sufficiently impressed with the success of IPL in the Resident Profile System to apply it in other areas. The second application for IPL was another demographic system, Mortgagor Profile, which provides statistics on beneficiaries of the agency's single-family housing programs. Like Resident Profile, this system was also scheduled for a large revision, and it is also oriented primarily toward ad hoc reports. Thus, although there were many differences in detail, the two conversions were conceptually very similar.

The third IPL application was on the borderline between a revised system and a new one. In the past, the Management Information System was used to track the process of proposing, planning and building a development. This has now been replaced by the Development Information System, a new system with a family resemblance to the superceded one.

Self-Contained 'Enterprise'

Each of these systems was implemented on a separate Cyphernetics user number, providing a high degree of segregation between them. For purposes of updating and routine reporting, each system is treated as an entirely self-contained "enterprise." This has allowed the staff to use, test and become familiar with many data base tools and concepts and to reap benefits in the area of special reports, prior to facing the traumas inherent in agencywide data base integration.

As the first step toward integration, another user number has been reserved for "special requests" and given all necessary permissions and information needed to read (but not alter) any of the data bases. This arrangement serves several purposes. It makes use of the user security features provided by Cyphernetics to protect the data bases from damage; it facilitates accounting for the costs of special requests; and it provides a base of operations for examining the separate data bases for data discrepancies, redundancies and conflicts.

In the past, this last function has only been performed sporadically, in the process of producing special reports requiring data from two or more data bases. However, increasing experience in this area has made the need for closer integration apparent, and studies are currently under way to examine the desirability of creating a position of Data Base Administrator.

Tentative plans include developing a data dictionary, unifying the separate data base directories and combining the various auxiliary sets used by the three main data bases, prior to making any changes in the principal data sets.

Whalen is chief of information services for the Michigan State Housing Development Authority.

Service Uses DB/DC Support

(Continued from Page 26)

sential to Warrington Associates, they converted to the Datacom/DB and Datacom/DC systems from Insyte Datacom Corp., Dallas, Texas, in 1976.

"Before we installed Datacom, we were having all sorts of trouble with our previous software," Warrington said. "We were getting no support, unpredictable performance and inconsistent response time. "In a business such as ours, where our value to our customers is efficiency, we simply can't afford to have inferior software," he said.

"Before we purchased Datacom, we did a detailed analysis. A key to our decision was the fact that the Datacom was an integrated system," he added.

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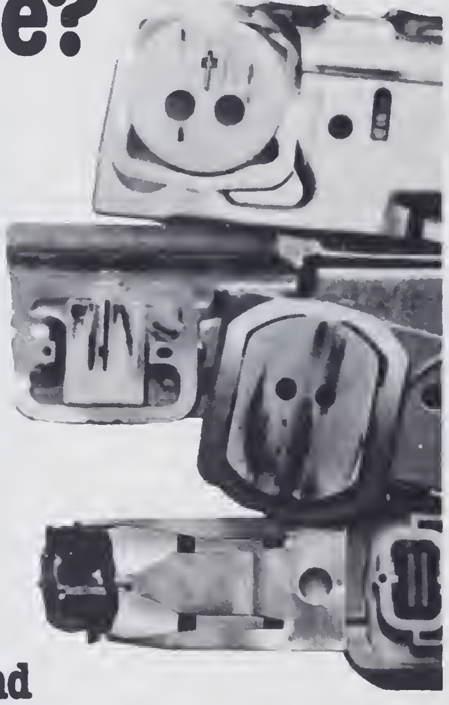

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French PTTer Says

Linking Packet Nets Next Standards Job

By Ronald A. Frank
CW Staff

ATLANTA — As packet-switched networks become operational, standards groups will direct their next efforts to the interconnection of these nets.

The current work of the Consultative Committee on International Telephone and Telegraph (CCITT) is aimed at establishing a packet internetwork standard which is presently designated X.7X, according to Jean Picard of the French postal, telephone and telegraph (PTT) authority.

Another issue that is becoming important is the interconnection of packet-switched nets with circuit-switched nets, Picard told attendees at a panel on international packet nets at the recent International Telecommunications Exposition (Intelcom 77) here.

It is not yet clear whether X.7X will be made available to users to interconnect private packet nets with public nets, Picard noted.

British Undecided

George Orchard of the British Post Office (BPO) said the UK does not necessarily favor either circuit- or packet-switched nets. There are now plans for a national circuit-switched net geared to digital equipment while another one, the EPSS network, will employ packet switching during a two-year test, he said, although EPSS will not be X.25-compatible.

Serge Wernicoff of Western Union International said one of the main roles of international record carriers (IRC) will be to interface the different standards used on each side of the ocean.

"If the past is any indication, the U.S. will not follow CCITT standards," Wernicoff said.

Speaking of the Data Base service inaugurated recently in cooperation with the BOP, Wernicoff noted this is a user experiment. "We cannot necessarily wait for standards. We must meet the needs of customers, even if this means we have to implement a service more than once," he said.

A session attendee asked the panelists why users are not better represented in international standards-making deliberations. Picard said it is often difficult to identify who the users of a communications offering really are.

There are very few large users that have a competent in-house technical staff, there are service bureau firms and finally there is the small user who wants simple, reliable, low-cost services, Picard said, adding the interests of these three types of users are not always in agreement.

The French Transpac network scheduled to begin service in 1978 was partly an outgrowth of the demands for a common shared network made by a French communications user group, he said. This group could not implement such a network because the PTT has a legal monopoly, so in-

(Continued on Page 30)

Network Planning Still an Art That Hinges on People: Survey

MINNETONKA, Minn. — Data communications network planning is still as much an art as a science, according to a recent study conducted by Data 100 Corp. and International Data Corp.

The study, which involved a mailing of 5,000 questionnaires, 70 telephone interviews and 35 in-depth personal interviews, found network planning is still more dependent on the talents and experience of the people developing the plan than it is on the use of a proven planning technique, the researchers said.

The existence of a comprehensive corporate plan for network development is the one exception. For the period from 1973 to 1976, 14% of the respondents surveyed reported their companies had a corporate plan for the development of their data communications network.

For the period from 1978 to 1983, the number rose to 22% with an additional 27% noting that they were formulating a corporate plan but its final form was not yet known.

For a large percentage of respondents, approving network applications on a case-by-case basis appeared to be an expedient solution to network development. In the past, 50% said network applications were approved on a case-by-case basis while 38% plan to continue approving applications on that basis in the foreseeable future — at least through 1981, the study results said.

Among the problems encountered in implementing a data communications network were hardware, software and people. Of the three, hardware appeared to be the least troublesome; only 7.4% of the respondents mentioned a lack of properly designed terminals that met their specific requirements as a major problem with 5.4% expecting it to be a problem in the future.

Software and people problems — "Sometimes hard to separate," the researchers noted — appeared to be the key factors limiting network development, especially development and implementation of networks with distributed data bases and distributed processing.

The most frequently mentioned problem was that the size and experience of the corporate DP staff was not sufficient to develop the necessary applications software. For the period through 1976, 31% said this

(Continued on Page 32)

HP Expands Net Capabilities; Links 1000, 2026 With 3000

By a CW Staff Writer

CUPERTINO, Calif. — Hewlett-Packard has extended its communications software to allow any terminal tied to an HP 1000 or an HP 2026 data entry system to interconnect with an HP 3000 Series II system in a distributed processing network.

DS/1000 brings to System 1000 users the capabilities announced for HP 3000 Series II users last May with the introduction of Distributed Systems/3000 (DS/3000) [CW, May 16].

DS/2026 allows the 2026 to function interactively, the firm said.

These systems, developed especially for entry and transmission of office information, formerly communicated only with one another or as passive RJE stations to large computers via standard IBM-compatible bisynchronous IBM 2780 or multileaving Hasp protocols.

The HP 2026 will be able to initiate transfer of an entire file since the new intercommunication link enables the console of any 2026 to act as an interactive, virtual terminal to the 3000. The 2026 can command the 3000 as if it were local, HP said.

Functions With DS/1000

New to HP small system users is the DS/1000 nodal addressing scheme, with store-and-forward capability at each HP 1000 system in a network. Now, at one node in the network, any HP 1000 can address any other HP 1000, using store-and-forward facilities, to communicate through any nodes that may intervene, HP said. This al-

(Continued on Page 32)

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Unit Monitors CRT Times

CLEVELAND — A microprocesor-based hardware monitor designed to compute, accumulate and print information on terminal response time has been announced by Computer Resources, Inc. (CRI).

Micromeasure monitors up to four CRT terminals simultaneously, recording response time, number of transactions, time of day, date, high/low responses and total time of transactions, CRI said.

Micromeasure costs $4,450 from CRI, 4650 W. 160th St., Cleveland, Ohio 44135.

Coates: Planning for Future Vital

By Kathleen Quinn
Special to CW

ATLANTA — Studying the future of telecommunciations is vital because "we now have mechanisms for predicting the future and for responding to it," according to Joseph Coates of the Office of Technology Assessment (OTA).

OTA is about to embark on a planning study to examine the public policy implications of telecommunications in a post-industrial society in which 50% of the work force is made up of information workers.

"We can now set and attain any goal we choose to," Coates said here recently. However, we are limited in that we can't do everything; therefore, "how do we allocate resources in a market-oriented society?"

One of the biggest problems with telecommunications right now is that the agencies controlling telecommunications are obsolescent, according to Coates. He cited the Federal Communications Commission (FCC) as an example of this.

FCC Geared to Broadcasting

The FCC is geared to broadcasting and has little or nothing to do with telecommunications, which is a huge new sector of the economy, he contended.

As a result, we have the "Petroleum Broadcasting System," as Coates called. the Public Broadcasting System (PBS), which he characterized as lacking drive, diversity and proper stimuli.

In addition, the FCC's "equal time in fairness" policy has led to programming "no more exciting than processed bologna." Controversy is limited to "two-bit arguments" over violence on TV and pornography, while the real problems of war, peace and internal decay are ignored, he added.

The Bill of Rights, too, may have become a victim of old age, Coates said. How can "freedom of the press," be interpreted, he asked, in an age when telecommunications inundates the press with so much information that in choosing what to print, it must also choose what not to print?

Defining Ownership

Another problem created by telecommunications is defining rights of ownership of information. This has surfaced in recent battles over software patents and copyrights, Coates noted.

"Planned disruption of our telecommunications systems is a danger for which we must plan, too," Coates said. "We must look also at the potential for torture and extraction of information afforded by telecommunications."

But, along with these problems, there are tremendous opportunities to be harnessed and used, he added. In its ability to link people of like concerns, telecommunications can create strong forces for social change.

Also, the opportunities in biomedicine, which Coates called "one of the greatest advances in medicine in the last 20 years," was made possible by telecommunications, he pointed out.

In answer to a question from the audience, Coates said that none of the concerns mentioned in his talk is presently being addressed by bills in Congress. Hopefully, the study on which his office is about to embark will help remedy this, he said.

Packet Net Link Next Standard

(Continued from Page 29)

stead it worked with the PTT on plans for the Transpac net, he recalled.

A similar process was followed in the UK, Orchard said, which led the BPO to implement plans for a packet net.

Another attendee asked what the carriers intend to do about data privacy and security. Picard said this question is concerned with the privacy of the data and also with control over access to terminal equipment operating on a network. In either case, the carriers have little control, he said.

Most of the panelists agreed the protection of data is not one of the concerns of a telecommunications carrier.

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Net Planning Still an Art

(Continued from Page 29)

was a major problem; 27% still see this a major problem through 1981.

Currently 10% of respondents see the lack of proven and reliable systems software as a major problem for network implementation. For 1978-1981, the percentage fell to 7%.

User Sophistication

The current level of end-user sophistication was seen in the past as a major bottleneck to network implementation, but in the future it is anticipated to be much less of a problem, according to the survey.

For the period 1972-1976, 28% of the respondents cited "corporate end user not yet ready to take advantage of network performance" as a major problem,but the percentage dropped to 14% for the future.

Another problem, according to the study, is corporate management's indecision on how and when to implement networks. Fourteen percent of respondents mentioned this as a problem in the past, and 18% anticipate it will be a major problem in the fuure.

The study also showed a clear trend to distribution of function, files and processing power within data communications networks. The trend of moving the data entry function closer to the source of data will continue through the end of 1978.

Those applications for updating files resident at the remote terminal and application processing by the terminal systems show the strongest growth through 1980 and beyond, the researchers noted.

When questioned about terminal requirements, respondents said they anticipate a greater use of minicomputers and terminals from independent vendors in their networks. While only 5% are currently using minicomputers, 8.6% expect to be using them by 1981.

HP Expands Net Capabilities

(Continued from Page 29)

lows a network to be configured as a star, a ring, a string or a combination of these arrangements. Multiple nodes can share links, reducing cabling or line costs, the firm added.

In addition, networks can be reconfigured without impact on previously written application programs since node addresses remain valid and accessible, a spokesman said.

The system also permits users to mix within the same network HP 1000 systems using disk-based RTE-III operating systems as well as those using RTE-M operating systems.

An HP 1000 user at any node is said to be able to access records in remote file on other 1000s or on a remote HP 3000 using simple calls.

DS/1000 supports I/O to remote HP 1000s and scheduling of programs in remote nodes via standard Fortran read/write statements.

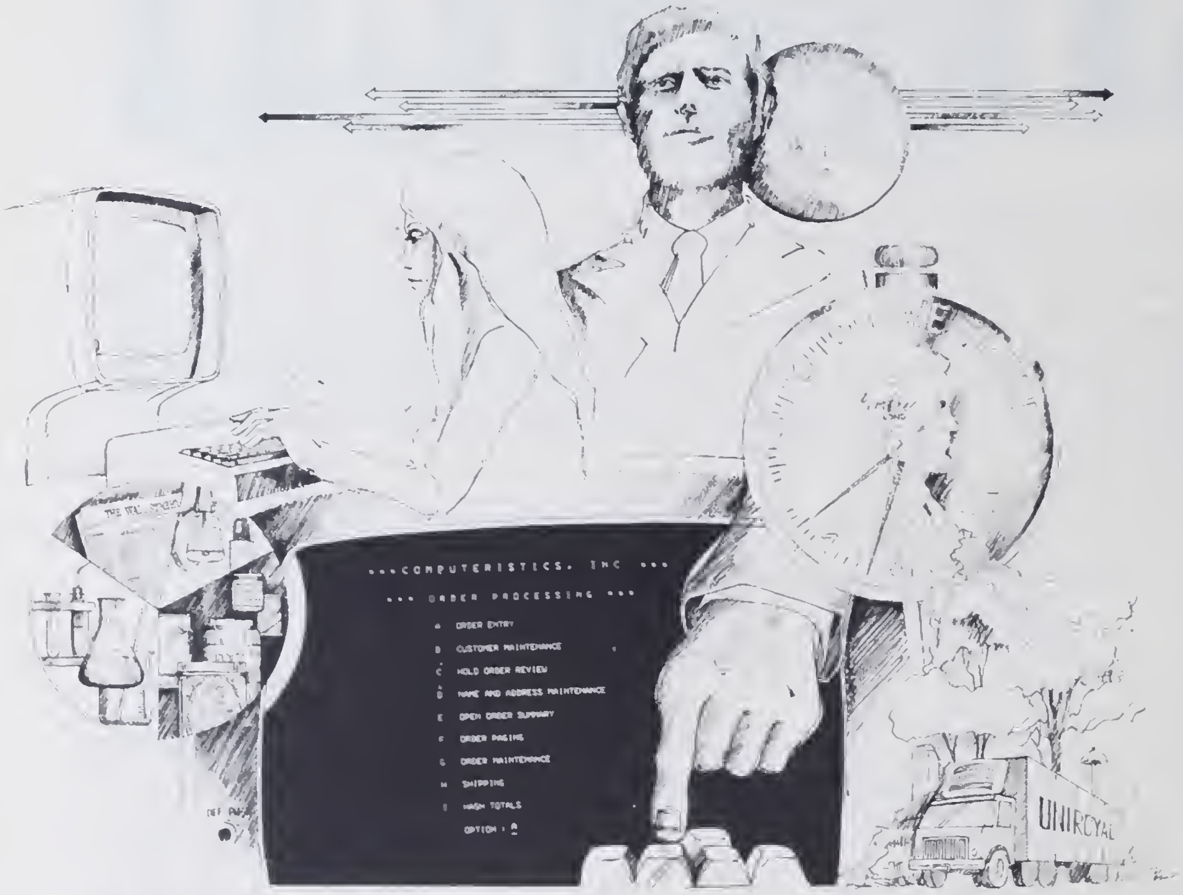
Printers and plotters at any DS/1000 node are therefore also at the disposal of the others via the interconnections.

Network communications on hard-wired or modem-based DS/1000 connections are protected by the use of VRC/LRC/DRC parity checking.

Such a distributed network is aimed at connecting R&D laboratory or manufacturing functions in a large organization with those of field sales offices to centralize the reporting of large numbers of dispersed and interrelated processing processes, HP said.

U.S. single-quantity list price for DS/1000 firmware and software to form one network link between two HP 1000s is $6,200. Additional links are $3700 each. The enhancement needed to link an HP 1000 to an HP 3000 Series II System is $500. First customer deliveries are expected in December.

The capability of linking the 3000 and 2026 is included in DS/3000 software, which costs $3,000 and which is available now, from Hewlett-Packard, 1501 Page Mill Rd., Cupertino, Calif. 94304.



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OLIS: A Powerful New Tool for Legislators

Prior to a session of the Oregon State Senate, staff aides Marcella D. Green and Gladys Johnson can check the status of pending bills, accessing the OLIS data base at an IBM 3277 Display Station in the Senate chamber.

In the Oregon State Capitol Building, in Salem, a Senator or Representative can step up to an IBM 3277 Display Station and learn the detailed status of any of thousands of bills pending before the state legislature: what committees have held or will hold hearings on it and when; what recommendations they made; how and when the bill was amended or otherwise acted on in each chamber; and when it will be called up for action again.

This information, referred to as Measure Status, is stored in one of two data bases included in the Oregon Legislative Information System (OLIS), an online computer system.

Generates Daily Calendars

The Measure Status subsystem helps schedule and manage the business of the legislature. It is used to generate daily and weekly Legislative Calendars with details of past and future activity on every pending bill, in committee and on the floors of the two houses.

"Without Measure Status," says Jason D. Boe, president of the Senate, "we would be hard pressed to keep track of the workload, to organize proper consideration of all the important legislation that comes before us. The computer is the ultimate legislative tool."

Adds William Stow, director of OLIS: "During the 1975 meeting of the legislature, the Measure Status subsystem was one of the factors that enabled the presiding officers to shorten the session to 153 days, compared to 180 in the previous session, despite a rise in the number of submitted bills from 2303 to 2449."

The other OLIS data base contains the complete text of the body of state law, known as the Oregon Revised Statutes (ORS), as well as all measures pending before the legislature.

By means of this data base, members of the legislature's staff can edit and proofread statutory language, working directly at 3277 Display Stations, entering all amendments to each bill as they are proposed.

To maintain this data base in the IBM System/370 Model 158, OLIS uses IBM's Advanced Text Management System (ATMS). Each new bill is entered via the keyboard of a 3277 Display Station or by means of an IBM Communicating Magnetic Card (CMC) Selectric Typewriter which can operate online, entering text directly, or off line, accumulating text on magnetic cards for later entry.

Simplifies Bill Editing

Some executive branch agencies have begun submitting bills already recorded on magnetic cards, which also serve as backup to the online data base.

ATMS permits material to be inserted, altered or deleted without rekeying of surrounding material, and with automatic renumbering of paragraphs and sections. For the 70 percent of all bills which revise existing statutes, ATMS can incorporate the unaffected language into the bill, avoiding manual entry and proofreading of this material.

A Text Retrieval subsystem of OLIS, based on IBM's Storage and Information Retrieval System (STAIRS/VS), is used for retrieving statutory material from the data base. It displays the desired portion of any statute, selected by subject matter or by key words in any combination.

At the end of each legislative session, the ORS must be set in type in its new form and printed. In recent years, as the legislature accomplished more work in each session, manual methods of typesetting and proofreading had begun to prove inadequate; the time required to prepare the ORS for printing had stretched into months, and the cost had mounted steeply.

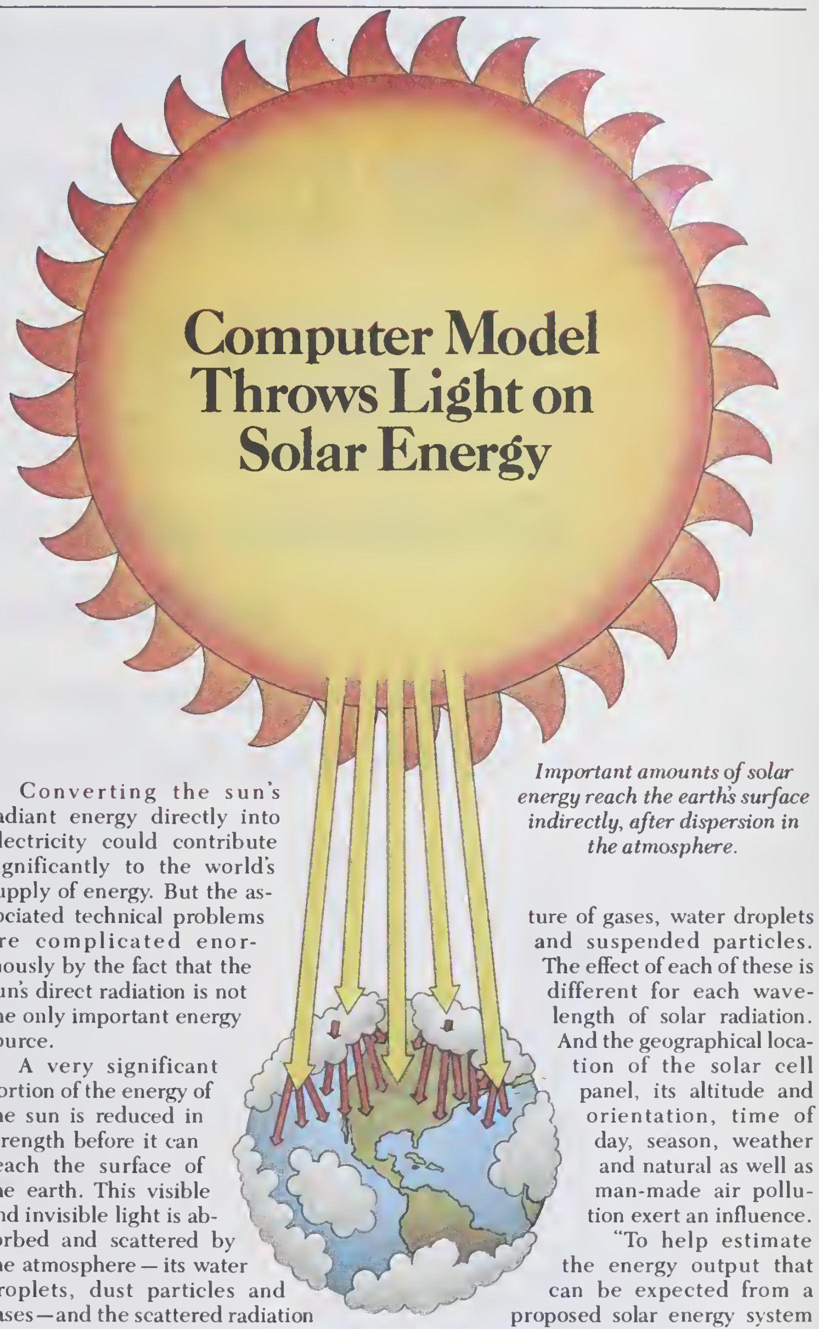
Now, at the end of a session, ATMS is used to incorporate the new and amended laws into the ORS, to generate a new ORS index, and to prepare for the required biennial printing of the ORS.

OLIS uses TERMTEXT/Format, an IBM program, to prepare material for the phototypesetter. Non-printing format-control characters in the text indicate to TERMTEXT/Format the required column width, type size and font, page and in-text numbering systems, page top and bottom matter and similar format details of the printed document.

"ATMS and TERMTEXT/Format work beautifully together," Stow says. "They were simple to incorporate into OLIS and they produce complex finished documents, remarkably free of errors, with very little wasted effort at the keyboard.

"After the session," he notes, "the ORS was printed earlier than ever before. And the cost was $300,000 less than our best proposal from a private company using phototypesetting."

Computer Model Throws Light on Solar Energy



Important amounts of solar energy reach the earth's surface indirectly, after dispersion in the atmosphere.

Converting the sun's radiant energy directly into electricity could contribute significantly to the world's supply of energy. But the associated technical problems are complicated enormously by the fact that the sun's direct radiation is not the only important energy source.

A very significant portion of the energy of the sun is reduced in strength before it can reach the surface of the earth. This visible and invisible light is absorbed and scattered by the atmosphere — its water droplets, dust particles and gases — and the scattered radiation arrives at a solar cell along a nearly infinite number of indirect paths.

At the surface of the earth, explains Dr. J. V. Dave of the IBM Scientific Center in Palo Alto, California, such indirect radiation can range as high as 40 percent of the total energy on sunny days, and 100 percent on mildly overcast days. A system utilizing all available radiation, he points out, can lead to a more efficient harvesting of solar energy under average conditions as encountered at various feasible locations.

Using the computer, Dr. Dave is experimenting with a solar energy model for a better picture of total radiation energy arriving at the earth's surface.

"We live at the bottom of a very complex atmospheric soup," he notes, "a mixture of gases, water droplets and suspended particles. The effect of each of these is different for each wavelength of solar radiation. And the geographical location of the solar cell panel, its altitude and orientation, time of day, season, weather and natural as well as man-made air pollution exert an influence.

"To help estimate the energy output that can be expected from a proposed solar energy system design, we hope to construct a computer model of the diffuse solar radiation in the atmosphere. At present we have completed an experimental model with one simplification: it considers only one orientation of the solar cell—directly overhead, at the zenith — a simplified, realistic representation of the atmosphere.

"Varying such parameters as time of day and atmospheric makeup, we have solved the radiative transfer equation for our models for several thousand data points. Allowing for our simplified fixed orientation of the cell, results show diffuse radiation is very significant in terrestrial cell performance. We are planning a model for an arbitrarily oriented cell using several million data points."

Software Products from IBM

Three products that extend the power of data processing systems:

1. Teleprocessing Network Simulator (TPNS) enables test and load measurement of terminal-oriented programs before installing terminals.

2. Conversational Monitor System (CMS) provides a full range of IBM interactive computing capabilities under Virtual Machine Facility/370 (VM/370). Supports program development and personal computing.

3. Advanced Text Management System II (ATMS II) is a conversational system that permits a terminal user to enter, edit, store, format, proofread and display text.

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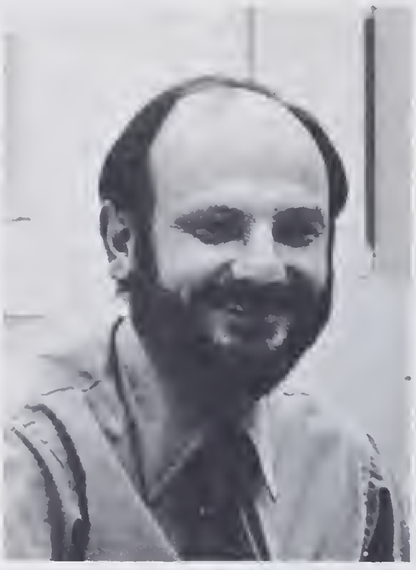

Dave Zeh

Dave is the System Family Manager of the NCR Interactive Family of Computers. He is a Purdue BSEE with 18 years experience in the development and use of computer systems. He is a key leader in NCR's Product Development Team. His management achievements include the development of the NCR 399 accounting computer and the starting of NCR-Wichita's development organization.

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System Family Management is a small group of senior computer architects with the responsibility of developing broad requirements for a family of computer systems and managing the relationship of the systems during development. Each staff member interacts independently with system developers and product managers to meet objectives. Two key individuals are needed in this area.

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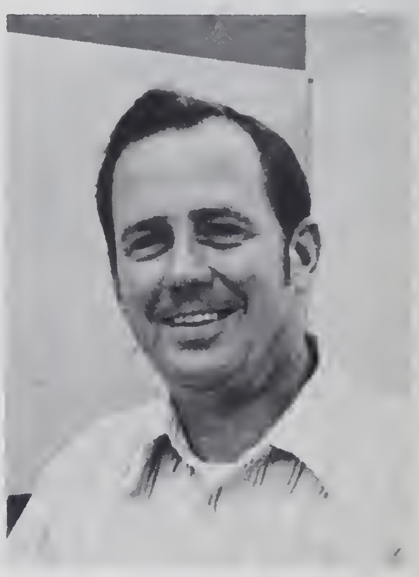
Niels Anderson

Niels, Manager of Advanced Development, has a Masters degree and 15 years experience in systems programming, technical management of software and hardware development. To Niels, the emergence of personal computing is the "tip of the iceberg" of the micro-electronics impact. Our challenge is to provide systems allowing the non-technical user access to information through new approaches capitalizing on cost/performance revolution and the ability to transcend disciplines to harness new technologies.



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Data Entry Conference Draws Over 300

• From Boiler Room to Waldorf

By Frank Vaughan
CW Staff

NEW YORK — "Data entry has moved from its traditional location in the boiler room to the Empire Room of the Waldorf Astoria."

That is how Norman Bodek, chairman of the First Annual Data Entry Management Conference, opened that recent meeting before a crowd of more than 300 here. Sponsored by the year-old Data Entry Management Association (Dema) and the American Management Associations, the conference drew participants from as far away as Spain, London and Singapore.

Explaining his opening remark, Bodek said for the past 20 years the data entry profession has been relegated to a position often both physically and mentally "down by the boiler room."

The conference marked data entry's exit from that situation — "We've come a long, long way," Bodek said as he looked around the mirrored room.

Bodek, who is also president of Key Universal Ltd., added that data entry has reached a new level of professionalism with the formation of an association and conference. The profession is changing every day, he noted, and the supervisor is no longer restricted to cards and keypunch.

Data entry is involved with tape, disk, interactive systems, CRTs, distributed systems and much more, he pointed out.

User Participation

The two and a half day meeting emphasized user involvement with the attendees taking part through hands-on workshops and panel discussions.

In a workshop in which distributed data processing was the subject, a panel consisting of Bodek, keynoter Bruce J. Wright of Systematics, Inc., John F. Whelen of Entrex, Inc. and Ivor Brownlee of Blue Cross/Blue Shield of Indiana wrestled with the problems of definition, concept and implementation.

The panel also participated in a lengthy exchange on the subjects of validating data and maintaining productivity. During this exchange, Brownlee said it may be cheaper not to validate the data with an on-line system that gives 1- to 2 sec response times, whereas with batch-oriented systems it may be less costly to validate.

Wright noted that the equipment has to be considered. Users can do alphanumeric field verification before the data hits the line. After the data hits the line, the operator should pursue the critical errors, he suggested.

Productivity and validation are trade-offs and many times all the data entry department can do is to verify selected things, he said.

Hot Stuff

This BASF Systems, Inc. data module Model 1335, which belongs to American Technical Industries of Mount Vernon, N.Y., recently came under fire — literally. Retrieved from a five-alarm blaze that ruined its plastic case, the module's 35 million bytes of stored data remained intact. The user was able to successfully dump the data onto another module and use the data in its DP operations.

• 'Arrows in Their Knapsacks'

By Frank Vaughan
CW Staff

NEW YORK — Like all those who forge new frontiers, data entry supervisors are finding "lots of arrows in their knapsacks," according to the keynoter at the First Annual Data Entry Management Conference, held here recently.

People involved in data entry have long been characterized as "just a bunch of keypunchers" and were comfortable with that description, Bruce J. Wright said. But, the director of communications for Systematics, Inc. noted, data entry people have been forging new frontiers in the past two years.

Back when he was first getting involved with data entry, and computers went down every hour without fail, Wright was told that "this is the keypunch area . . . where all the errors begin," he recalled.

Now, however, data entry management is in a position to start a revolution like DP has never seen before because "we are facing a challenge of management," he told attendees at the conference sponsored by the Data Entry Management Association and the American Management Associations.

The Challenge

"We are looking at systems the way they should be looked at. Systems are static. The beauty of a computer is that it does the same thing over and over.

"But if a business is static, it is going to be gone tomorrow. We have to overlap this static condition. Data entry is faced with feeding a dynamic business with a static means. That is the challenge," Wright pointed out.

"We have enough computing capacity to meet the needs of every business for the next 20 years. The real bottleneck is how to feed this technology to keep it as dynamic as the businesses," he added.

"How dynamic is a keypunch?" Wright asked. "There is nothing more boring than banging on those keys — boom boom boom — taking a break and doing it again."

Managers "face the task of going from the 'girls down the hall' image to the 'key-to-data entry' image."

Different Work

In the next decade, 60% of data entry managers will not be doing the same work, Wright predicated. Some 20% will completely change professions, 10% will be overtaken by obsolescence, 1% will die and the remaining 9% will be doing the same type of work, he said.

"You will be either a 'changer' or a 'changee' because the person

(Continued on Page 37)

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Data Entry at Seattle Bank

Mixed-Breed System Runs Like Thoroughbred

By **Jeffry Beeler**
CW Staff

SEATTLE — Although it looks like a "mixed breed," the key-to-disk system in Seattle-First National Bank's credit card data entry department operates like a thoroughbred.

For two years, the system had consisted primarily of 27 video keystations that permitted only one mode of data entry. But, last August the bank supplemented five of the on-line keystations with optical character recognition (OCR) units to produce a "mongrel" data entry system that yielded 60% higher throughput than its "pure breed" predecessor.

And Don Ricker, the bank's assistant vice-president and operations manager, plans additional refinements that could boost the hybrid system's throughput even more.

The sequence of events that ultimately led to the union of optical and keyed data entry here began when the bank issued its first credit cards in 1966. At that time, Seattle-First used magnetic ink character recognition techniques to process its checks and credit-card sales slips.

Checks were read on "proof machines" and on a giant reader/sorter that computerized dollar amounts and produced batch checking totals.

Six years later, when it changed its credit-card billing system, the bank upgraded its data entry method to accommodate a key-to-disk system that included a built-in shared processor to speed throughput and balance batches. The new system easily outperformed the proof machines, but Tom Harkins, the bank's vice-president and manager of credit and collection, still sought a better data entry technique.

Too Expensive

Heeding his instinct to install optical scanning equipment, Harkins at first evaluated a large OCR data entry system that could read most of the bank's sales slips and leave the rejects for manual keying. But conventional OCR equipment proved too expensive and threatened to disrupt the bank's internal operations, Harkins concluded.

So the Seattle-First vice-president decided to replace his bank's original key-to-disk system with a more advanced model. Harkins reasoned that the proposed system would have to accommodate 28 keystations, incorporate an adding machine keypad to speed data entry and provide multiple balancing levels to ensure batch integrity of the sales slips, merchant batch and bank branch.

He also demanded that the alternative system provide a special routine that would automatically increment the reference number series for sales slips.

Based on these criteria, Harkins and his colleagues selected a general Computer Systems, Inc. (GCS) 2100 key-to-disk system, which they installed in August 1975. But although the replacement system delivered the additional capacity and programming the Seattle-First needed, he still regarded OCR as the key to the bank's data-entry future.

So Harkins helped form an informal evaluation committee that investigated equipment from several vendors and toured various OCR installations. It also outlined three major criteria the prospective OCR system would have to meet. Such a system, they agreed, would have to provide

(Continued on Page 37)

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Why the big ones fail.

The big mainframes are expensive to begin with. And even they can fail. Which can leave you high and dry in the on-line environment. But there are other difficulties with the big numbers, too. Of prime consideration in the on-line world, they offer very limited throughput for their price. And by the time you've hung a lot of communications lines on them, they suffer a derating which makes their performance even less attractive.

And whereas you may eventually need that kind of horsepower in your on-line system, chances are it's an expensive overkill at the outset. What you need is a system which will do the job efficiently on the way in, and grow as your needs grow, in modest price increments. It makes the big systems people wish they were more flexible.

One mini just won't make it.

Minis have made a name for themselves, justifiably. But in the world of on-line, where needs keep growing, the one mini system just can't cut it. With the architectural limitations inherent to a single mini system, growth can build system overhead so fast you'll grind to a halt before you know it.

And strap-ups will kill you.

The answer might seem to be to strap two processors together. One goes down, and the other takes over. Right? Wrong. It's not that simple. System software for a single processor system won't run on the strap-ups. And the fate of any transactions-in-process at the time of a failure is unknown. As is the state of any records being updated. And growth beyond the original system capacity is well nigh impossible.

What you really need is the one multiple processor system designed for multiple processor operation. Tandem's NonStop System.

The four major "on-line" considerations.

When anyone is considering an on-line system, regardless of size, there are four primary points to consider. Throughput. Availability. Data Integrity. Transaction Protection. The system must be able to handle the job. It must be there when you need it. You must be sure of the integrity of your data base. And you must be sure you don't lose or duplicate a transaction. Even during a failure. No single processor system anywhere can provide that assurance. It takes a multiple processor system designed for the on-line environment, and Tandem is it.

For better throughput, spread the files.

We built the Tandem NonStop System with geographic independence of programs and files. They're handled automatically under Enscribe, our Data Base Record Manager. And instead of having one processor with one bottlenecking channel and a

The Tandem 16 NonStop System is composed of multiple, independent processors with dual redundant communications paths. The unique interaction between Tandem hardware and software assures not only continuous operation, and the integrity of your data base, but also throughput unmatched by any other computing system of comparable cost.

Bank Uses Assorted Data Entry

The Seattle-First National Bank's credit card operation uses a key-to-disk system supplemented with OCR.

(Continued from Page 36)

a 100% back-up, have a minimal impact on the bank's current operations and demand minimum software and interface conversion.

After a five-month study, Seattle-First configured a mixed-media data-entry system that combined GCS key-to-disk hardware with Keytronic OCR units. Bank officials signed a contract for the system last February and installed two testbed units by the Fourth of July. After six weeks of trial operation, the system began regular service.

To operate the system, a clerk loads a set of merchant sales slips into the hopper of the Keytronic datareader, which scans each cardholder's 13-character identification number. The system then imprints this information onto the sales slips in the standard OCR 7B font.

A Motorola 6800 microprocessor in the recognition electronics verifies bank number and account number digits, controls timing and rejects spurious readings, and performs other housekeeping chores.

As each character passes under the datareader's head, scan lenses focus an image on a photodiode array. The datareader then photographs every 1/5,000 in. of the character being read and translates the image into electrical impulses. These values are compared with the OCR 7B font characteristics, and the recognition electronics identifies the character.

To further improve the key-to-disk system's performance, Ricker is considering redesigning the sales slips, modifying the bank's operating procedures or installing an imprinter that produces more machine-readable information than the current unit.

Get Arrows In Knapsacks

(Continued from Page 35)

who is sitting and waiting for it to happen will have it happen all over him," he told conference attendees.

Labor Intensive

Communications costs will drop about 11%, computer logic will cost 25% less, memory components will drop 40% per year and the cost of people will jump an annual 6% minimum. The most labor-intensive area of DP is data entry and it is the challenge of the data entry manager to change that area.

"We in data entry are the change agents . . . but we are reluctant to see our own bubbles burst. This is another of our challenges. We should use the turtle approach — slow and easy."

But, Wright noted, if the turtle never sticks his neck out, he will never get anywhere.

"The data entry manager has the opportunity to make a greater impact than any member of the company," he said. "Just pick up the pieces, look down the road and say: 'This is my time.' "

processor system anywhere an "on line" environment.

fixed priority system, Tandem's NonStop System distributes the work and the files across multiple processors, multiple discs, and multiple channels. Enscribe controls the pattern and the flow for maximum efficiency. Because of simultaneous disc accesses, there's a dramatic improvement in response time. It's one of the performance benefits about a multiple processor system which you can't get on a single processor system.

Ease of programming, by design.

Historically, multiple processor systems have been a bear to program. Not with Tandem. Guardian, Tandem's operating system, lets you write your programs as usual. You can add more processors, or memory, or terminals as you need them. No need to rewrite programs. Ever.

And we make it easy to write the programs in the first place, with COBOL or with TAL, a powerful language designed for fast, flexible programming. The software development tools of this mini-based system rival those of far more expensive systems, and include NonStop operation, data communications, mirror volume capability, full file protection, screen formatting programs, and a host of housekeeping utilities.

When you're thinking "on-line," think in Tandem.

Which means think in multiples. Few, if any, "on-line" systems can be installed and forgotten. The number of transactions, the number of terminals on-line, or the number of applications programs to be run on the system keep growing. Most likely, all three will multiply.

Which is traumatic unless you've started with the one system on the market which can grow with you—even if the growth occurs during the initial configuration phase—without having to start all over again.

NonStop growth and NonStop protection, too.

Because the Tandem System was designed for NonStop operation in both hardware and software, it offers an extraordinary measure of protection against a failure in any processor, I/O channel, disc drive, or in the software. No other system offers this measure of assurance.

When a failure does occur in any segment of the system, its back-up counterpart completes the task, without a hitch. Since all programs are geographically independent, and the operating system both distributes and monitors all work-in-process, recovery from a failure is instantaneous. There is no restart; no backing up to a hopefully safe point.

The system monitors its own operations, performing all tasks in a distributed fashion across the multiple processors. Even when a CPU goes down, another CPU is immediately aware of the failure and picks up the task in process and completes it. No data and no transaction need ever be lost or duplicated. The integrity of the data base can be fully protected. It is truly unusual, but it's one reason why we say no single processor system anywhere can touch us in the "on-line" environment.

NonStop software.

Guardian: Operating System.

NonStop operation.

Automatic re-entrant, recursive and shareable code.

Virtual memory system.

Geographic independence of programs and peripherals.

Enscribe: Data Base Record Manager.

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Envoy: Data Communications Manager.

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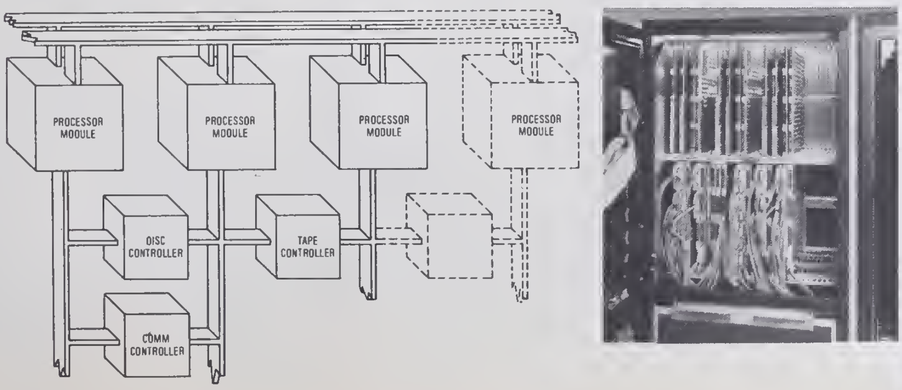
Photo and schematic show three processor modules with space for fourth module, interconnected to disc controllers, tape controllers and communications controllers.



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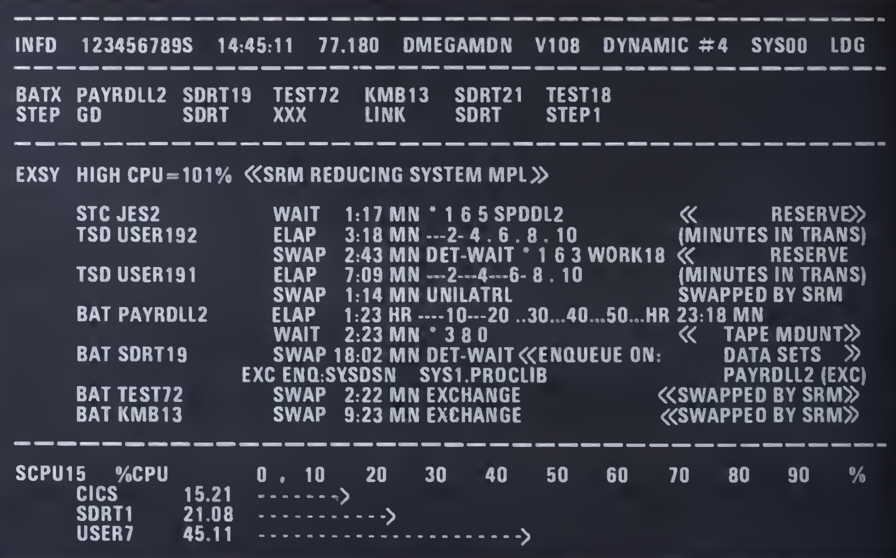

```
------------------------------------------------------------------------
INFD  123456789S  14:45:11  77.180  DMEGAMDN  V108  DYNAMIC #4  SYS00  LDG
------------------------------------------------------------------------
BATX  PAYRDLL2  SDRT19  TEST72  KMB13  SDRT21  TEST18
STEP  GD        SDRT    XXX     LINK   SDRT    STEP1
------------------------------------------------------------------------
EXSY  HIGH CPU=101%  《SRM REDUCING SYSTEM MPL》

      STC JES2            WAIT   1:17 MN ' 1 6 5 SPDDL2          《        RESERVE》
      TSD USER192         ELAP   3:18 MN ---2- 4 . 6 . 8 . 10     (MINUTES IN TRANS)
                          SWAP   2:43 MN DET-WAIT ' 1 6 3 WORK18 《        RESERVE
      TSD USER191         ELAP   7:09 MN ---2---4---6- 8 . 10     (MINUTES IN TRANS)
                          SWAP   1:14 MN UNILATRL                 SWAPPED BY SRM
      BAT PAYRDLL2        ELAP   1:23 HR ----10---20 ..30...40...50...HR 23:18 MN
                          WAIT   2:23 MN ' 3 8 0                 《   TAPE MDUNT》
      BAT SDRT19          SWAP 18:02 MN DET-WAIT《ENQUEUE ON:         DATA SETS  》
                       EXC ENQ:SYSDSN   SYS1.PROCLIB                PAYRDLL2 (EXC)
      BAT TEST72          SWAP   2:22 MN EXCHANGE               《SWAPPED BY SRM》
      BAT KMB13           SWAP   9:23 MN EXCHANGE               《SWAPPED BY SRM》
------------------------------------------------------------------------
SCPU15   %CPU         0 ,  10    20    30    40    50    60    70    80    90    %
      CICS      15.21  ------->
      SDRT1     21.08  ----------->
      USER7     45.11  ---------------------->
```

OMEGAMON displaying exception information and tasks with high cpu utilization.

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How many of these problems do you have?

Tape Mounts?

```
BAT PAYROLL2      WAIT 2:23 MN      ' 3 B 0       《TAPE MOUNT》
```

Batch job PAYROLL2 waiting 2 minutes 23 seconds on a tape mount.

Enqueue Waits?

```
BAT SORT19        SWAP 18:02 MN DET-WAIT  《ENQUEUE DN   OATA SETS》
                  EXC ENQ: SYSOSN SYS1.PROCLIB          PAYROLL (EXC)
```

Batch job SORT19 swapped out (detected wait) for 18 minutes 2 seconds due to enqueue on data set SYS1.PROCLIB currently held by job PAYROLL.

Dasd Dropped Ready?

```
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+ OANGER:DASO OROPPED READY AT AOORESS 162       VOLUME-MVSRES  +
+ CURRENT USER: JES2                                            +
+ DEPTH OF I/O QUEUE: 4                                         +
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

Dropped ready exception indicates address, volume, user and number of I/O's waiting on device.

Initiators Tied Up?

```
BAT     PAYRDLL     ELAP   1:23 HR ----10---20>.30...40...50...HR 23:18 MN
BAT     SORT21      ELAP 45:17 MN ----10---20---30>.40...50...HR 35:17 MN
BAT     TEST1B      ELAP 12:03 MN >.10 ...20...30...40...50...HR   2:03 MN
```

Elapsed time exception analysis for batch jobs. Thresholds are assigned on a job class basis (1 hr for PAYROLL, 10 min. for SORT21 and TEST18). Elapsed time is on left, "over-time" on right, and plot of over-time in between.

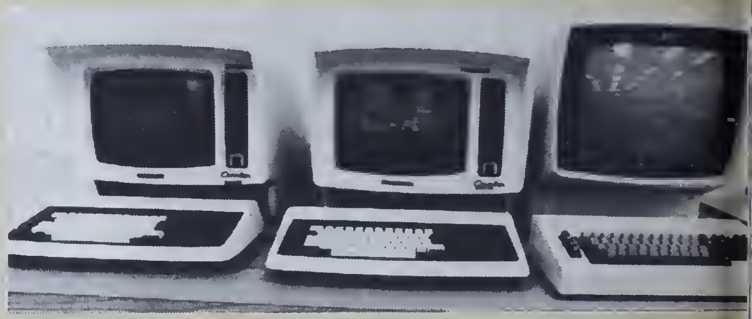
TSO Response Time?

```
TSO     USER192     ELAP 3:18 MN---2->4 . 6 . B . 10 (MINUTES IN TRANS)
TSO     USER191     ELAP 7:09 MN---2---4---6->B . 10 (MINUTES IN TRANS)
```

TSO response time exception analysis. Time thresholds are assigned on a transaction "period" basis.

```
PGRP02
PRO #01  #TRANS:    29B SWAP/TRANS: 1.0 RESPONSE (SEC)    .4
PRO #02  #TRANS:    175 SWAP/TRANS: 1.6 RESPONSE (SEC)   2.1 # #
PRO #03  #TRANS:     64 SWAP/TRANS: 1.7 RESPONSE (SEC)   7.3 # # # # # #
PRO #04  #TRANS:     1B SWAP/TRANS: 1.7 RESPONSE (SEC) 12.B # # # # # #
```

TSO response time information by period number (ie. by complexity of transaction.)



Reserve Lock-outs (Multi-system environment)?

```
STC JES2            WAIT  1:17 MN ' 1 6 5 SPOOL2         RESERVE
TSO USER192         SWAP 2:43 MN ' 1 6 3 WORK1B          RESERVE
```

In a multi-system environment with shared dasd, RESERVE lock-out detection can be crucial. When running V=R and EXCP to a 3270, OMEGAMON requires no I/O to dasd devices or control units and is not affected by console lockouts (WTO/WTOR).

SRM Swaps?

```
EXSY    HIGH CPU=101%   《SRM REDUCING SYSTEM MPL》
        TSD USER191       SWAP 1:14 MN UNILATRL       《SWAPPED BY SRM》
        BAT TEST72        SWAP 2:22 MN EXCHANGE       《SWAPPED BY SRM》
        BAT KMB13         SWAP 9:23 MN EXCHANGE       《SWAPPED BY SRM》

SCPU10    %CPU  0   10   20   30   40   50   60   70   B0   90   %
        TCAM  11.1B----->
        CICS   15.21-------->
        SDRT1 21.0B----------->
        USER7 45.11----------------------->
        TEST2 13.27------->
```

The high cpu utilization causes the system resources manager to reduce the number of active tasks (MPL) in the system. As a result we see a TSO user having to wait for 1 minute while 2 batch initiators are frozen for a total of 11 minutes. The SCPU10 command selects any task using more than 10% of the cpu. (Note TSO user USER7 had 45.11% cpu utilization which indirectly caused the batch jobs to be swapped out)

Storage Exceptions?

```
TSO     USER22      EXCESSIVE WORKING SET SIZE =  300K
                    EXCESSIVE NDN-VID SLOTS    = 1300K
BAT     SDRT21      EXCESSIVE FIXED FRAMES     =  1B0
BAT     PAYROLL2    EXCESSIVE SWAP COUNT       =   51
```

OMEGAMON exception analysis for real and virtual storage and swapping.

SOME OF THE PROBLEMS DISCOVERED BY OMEGAMON

SYSTEM LOCKED OUT!
- JES2 waiting on SPOOL control unit
- MVSRES had pseudo reserve (34 I/O's)
- PLPA waiting on I/O
- MSS – virtual disk

Severe System Degradation
- MVS under VM:SRM problem
- Spool pack full
- SMF Buffers (batch)
- high paging: TSO Edit used VIO
- dasd dropped ready (Scratch pack)

Moderate System Degradation
- 2 page data sets on same 3330
- insufficient TCAM buffers
- local page data set: inoperative
- shared dasd logic on single system
- main storage shortage due to SQA contamination from a CICS test system

ONLINE SYSTEMS
- CICS in a loop
- TCAM in error recovery
- CICS: dasd competition from batch
- Tape control unit lock out

TSO Problems
- contention on TSO storage pack
- tape swaps (DDR)
- waits on usercatalogs
- inter system reserves
- TSO loop
- waiting on SMF buffers
- SRM swaps

Batch Problems
- tape mounts
- data set waits
- Batch job in loop
- SRM swaps

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Two for Price of One

Pottawattamie Finds Dual Minis Pay Off

By Ann Dooley
CW Staff

COUNCIL BLUFFS, Iowa — Pottawattamie County pulled its payroll off a service bureau and its accounting applications off an outdated accounting machine and put them on two minicomputers to save time and improve work flow.

The county DP center here decided to purchase the Olivetti A5 minicomputers more than a year ago and the county auditor, Douglas Primmer, feels it's the best choice that could have been made. "Expense-wise, it's the best — we have two machines for the price of one," he explained.

Primmer looked at Burroughs and NCR equipment as well as the A5, but decided that for the county's needs the simpler system seemed the best, he said.

The county's problem wasn't really speed but workflow, he recalled. "We were working with slow turnaround time and an antiquated system," he said.

In addition, the payroll for the more than 400 county employees was done by an outside vendor and the turnaround time was not good, according to Primmer.

When an error occurred on a payroll check, it could not be corrected until the next paycheck was issued. Now an error can be corrected immediately.

Now, one minicomputer performs payroll and checkwriting applications and the other handles the accounting functions. In addition, one A5 is used for program development; the other runs the applications.

Backup in a Pinch

In case of a pinch, Primmer said, both could be used for one function; if one went down, the other could be used as a backup. The systems also perform all the bookkeeping and produce reports for the county, which has a population of 90,000.

In addition to providing faster turnaround time, the systems are easier to use and the number of operator errors have therefore been reduced, Primmer said.

Olivetti has provided good service and maintenance since the sale, he said, adding the vendor maintains all the county's data on cards which can be used on Olivetti's own system, if necessary.

The county's A5 systems might be expanded if the work keeps increasing and it proves necessary, Primmer commented.

Pottawattamie's present systems are valued at about $16,850 including programming and maintenance. The basic components of each system include a microprocessor, random-access memory, keyboard, printer, magnetic card unit, communications logic and logic to accommodate optional peripheral devices.

Higher Expectations of Users Seen Buoying Distributed Trend

By Esther Surden
CW Staff

SEATTLE —Small is beautiful, a panel of vendors and consultants agreed here recently during a session on minicomputers at the Association for Computing Machinery conference.

Minicomputers are becoming more complex, and at the same time people have higher expectations for their systems, according to David Nelson, director of research for Prime Computer, Inc. The trend toward both interactive and distributed mini systems will continue, he predicted.

Nelson identified several hardware trends. Among them: minis will begin to use larger virtual address space, and more sophisticated data management systems will become available.

In the software area, better command and query-type languages will be developed.

Hardware features that will appear include greater use of cache memory and file systems distributed across networks.

Some communications advances also can be predicted, he said, and vendors of minicomputers will begin supplying packaged networks in the future. Considerable advances will take place in local networking with the increased use of very fast coaxial cable and fiber optic methods.

Slow Software Development

Ned Chang, senior vice-president for marketing at Wang Laboratories, Inc. said advances in hardware have far outstripped advances in software.

Software development moves very slowly in comparison to the swift advances that have been made in such areas as chips, bubble memories and disk capacity, he said. Prices of memory and even of printers have come down, while software remains very expensive, he indicated.

Although adequate progress has been made in the development of "languages for use by the computer professional," at the end-user level the only advances have been the direct results of transaction processing,

(Continued on Page 41)

Mini Bits

Series/1 Joins Common

BOSTON — Users of IBM Series/1 minicomputers at a recent meeting here formally petitioned Common, the IBM small systems user group, to establish a permanent project within that organization.

The Series/1 users will join IBM System/3, 1130, 1800 and DOS users, which each have special categories.

HP Hikes Education Prices

SANTA CLARA, Calif. — Membership and newsletter subscription fees for the Hewlett-Packard Educational Users Group will be increased effective today.

For people in organizations that use HP computers, the combined membership and subscription fee will be $8 a year. In the past it was free.

However, a designated site representative and four other people in user organization will receive all user group communications, services and the newsletter free of charge, the firm noted. Back issues of the newsletter can be obtained for $1.25 per issue.

The newsletter subscription fee for people in organizations without HP computers will be $20 year, up from $6. Back issues for this group will be priced at $2.50 per issue, HP said from 5303 Stevens Creek Blvd., Santa Clara, Calif. 95050.

Charles River Enhances Floppy

WALTHAM, Mass. — Charles River Data Systems has enhanced its MF-11 floppy disk system with an additional "quad backplane."

The MF-11 using the quad backplane can accommodate several interface cards for any of the various peripherals used with Digital Equipment Corp's LSI-11, Charles River claimed.

The unit is reportedly "functionally identical" to the DEC PDP-11/V03, a spokesman noted. It houses a Shugart dual floppy disk system, front panel console and power supply.

A basic system with the option costs $4,790. The company is located at 235 Bear Hill Road, Waltham, Mass. 02154.

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DG Adds Fixed-Head Drives for Nova, Eclipse

WESTBORO, Mass. — Data General Corp. has introduced two fixed-head "Winchester" disk drives for its Nova and Eclipse subsystems.

The subsystems transfer data at 910,000 byte/sec; the average access time is 10.12 msec, DG said.

The drives are available in 1M- and 2M-byte capacities. Both are 8.75-in. high, rack-mounted units.

Maximum subsystem capacity is four drives per subsystem in any combination of the two sizes, the firm said.

The subsystems are supported by the DG Advanced Operating System (AOS) and Real-Time Disk Operating System (RDOS). They were designed for instrumentation users who need to store data collected at very high rates, for commercial users in applications requiring high transaction rates for keyed data access and for time-sharing users as swapping devices.

The subsystem receives commands via the data channel instead of programmed I/O control, DG explained. Multiple data sectors can therefore be read using a queueing technique in the controller, eliminating interrupts and central processor intervention between sector data transfers.

This "data chaining" is supported in RDOS and AOS, while controller hardware also permits user-written channel program "command chaining," a spokesman noted.

A second major controller feature is error correction, he said. When writing data, the controller calculates a 32-bit error-checking code reminder which is written on the disk as a postamble to the data.

When reading, the controller recalculates checkwords and checks in hardware for error indications. This technique permits error detection in hardware and software correction of all single-burst errors up to 11 bits long in a 512K-byte sector, DG claimed.

A 1M-byte subsystem costs $9,900 while a 2M-byte subsystem is priced at $13,900, DG said from Rte. 9, Westboro, Mass. 01581.

User Expectations Rising

(Continued from Page 39)

he stated.

"Forgiving" user-oriented software must be developed, Chang stated. The development of such software will help place computers not only on every person's desk but also at home for entertainment, he predicted.

With another point of view, Kithie Gately, software director for Administrative Systems, Inc., said the hobbyist computers can also be used for small business applications. "The hobbyist micro is indeed a very powerful tool" that can support sophisticated languages and powerful operating systems, she told the group.

Warnings About Turnkeys

A turnkey minicomputer vendor, Robert Sheer, president of Boston's Sheer Development, warned users to beware of vendors who are really just "relieving the small business people of their assets." Although there are several reliable firms, a lot of turnkey systems houses take total responsibility for hardware and software when they do not have the staff to do so nor the qualifications to fix the systems.

To a small business person, a minicomputer promises the relief from clerical chores that the large companies have seemingly achieved. But in actuality, the large companies are trying to escape from the control of a large central DP department that did not live up to that promise. This is what is becoming known as distributed processing, he added.

Finally, a consultant to first-time users gave the attendees a hint on how to select a minicomputer. According to Gordon Stokes, professor of computer services at Brigham Young University, and a consultant, the most important aspect of selecting a small system is to make sure the system will accommodate the applications you will want to perform in the future.

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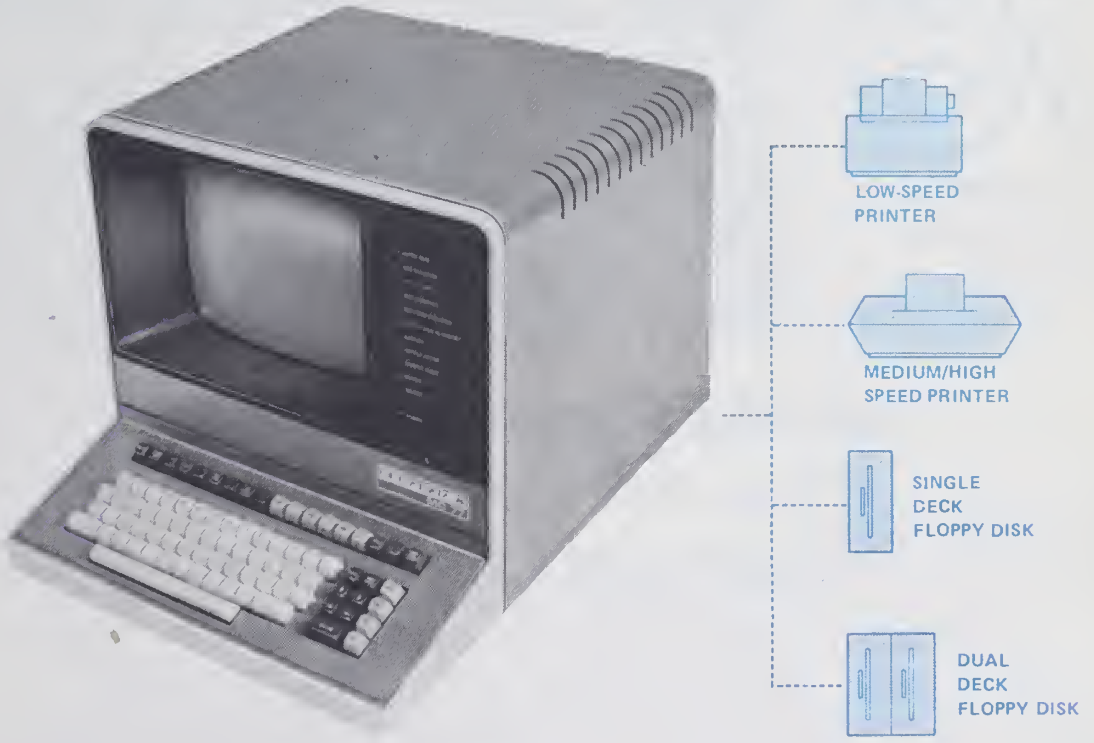

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Microdata Adds System

IRVINE, Calif. — Microdata Corp. has announced a business computer system dubbed Royale with what is said to be "a totally new architecture" compared with its existing product line.

The features of Royale's computer architecture include an I/O processor (IOP), expanded core memory and increased firmware, the firm said, and the Royale is upward compatible with the firm's existing Reality system.

400% More Firmware

According to Ted Ellison, Royale family project manager, firmware in the Royale CPU has been increased 400%. Two-thirds of the new firmware is devoted to the operating system with the remainder allocated to improved diagnostics, he said.

Languages used with Royale are "English, Microdata's retrieval language for data access and report generation: Data/Basic (with firmware implementation); Proc, a procedural control language; RPG II; and Runoff, a word processor language designed to work without file structure.

The basic system consists of 16K bytes of main memory, one 10M-byte disk, one 37.5 in./sec "Lode Star" cartridge tape unit, one CRT terminal and one 120 char./sec printer and costs $35,995.

Deliveries will begin in December.

Microdata is located at 17481 Red Hill Ave., Irvine, Calif. 92714.

UL-Approved Media Safe Holds Small User's Records

LAFAYETTE, Ind. — Schwab Safe Co. has designed a media safe, called the Fireguard, to handle the record storage requirements of the typical small systems user.

Certified by Underwriters Laboratory (UL), the safe requires 6.75 sq ft of floor space. It will accommodate 50 tapes in seals, 540 diskettes in trays or three 3348 data modules on roll-out shelves, Schwab said.

Optional interior components are available to customize the safe's interior to the user's specific application, a spokesman noted.

The safe is equipped with a "Group 2" key change combination lock and an approved relocking device to set the bolts if the lock is punched in a burglary attempt, he said.

Optional X-ray proof locks or key-locking combination dials provide security against theft or espionage, the firm added.

Without interior cabinetry, the safe costs $1,395. Interiors vary according to each users needs, the spokesman explained from 3000 Main St., Lafayette, Ind. 47902.

TI Calculator Works as Basis Of Business Unit

LUBBOCK, Texas — Texas Instruments, Inc. has introduced the SR 60A, a computer/calculator that reportedly works as the basis of a business system.

The SR 60A uses a microprocessor to control an optional letter-quality typewriter with full I/O capability for full-page reports and multiple-copy forms printouts, TI said.

The microprocessor can also control up to two digital-quality cassette tape drives with file management capability for on-line storage and retrieval of payroll records, inventory status and sales orders, a spokesman noted.

The SR 60A can handle inventory, payroll, general ledger, accounts receivable, income tax, cost estimating and pensions.

The basic machine, which weighs 16 lbs, provides up to 2,640 program steps or 330 data registers, expandable to 7,920 program steps or 990 data registers with optional memory modules, TI said.

The SR-60A costs about $1,995. TI can be reached through P.O. Box 53, Lubbock, Texas 79408.

PAI Puts Z80 At System Heart

LEE'S SUMMIT, MO. — Profit Assurance, Inc. (PAI) has a business system based on the Z80 microprocessor unit.

The Model Z1001 system configuration includes up to 64K bytes of memory; two dual-density floppy disk units; a 132-column, 300 line/min printer and a 1,920-char. CRT.

With the firm's FDAM operating system and Z80 macro assembler, the system costs $13,325.

The unit is expandable with magnetic tape units, multiple CRTs and 70M-byte disk units, PAI said from 818 Parklane, Lee's Summit, Mo. 64063.

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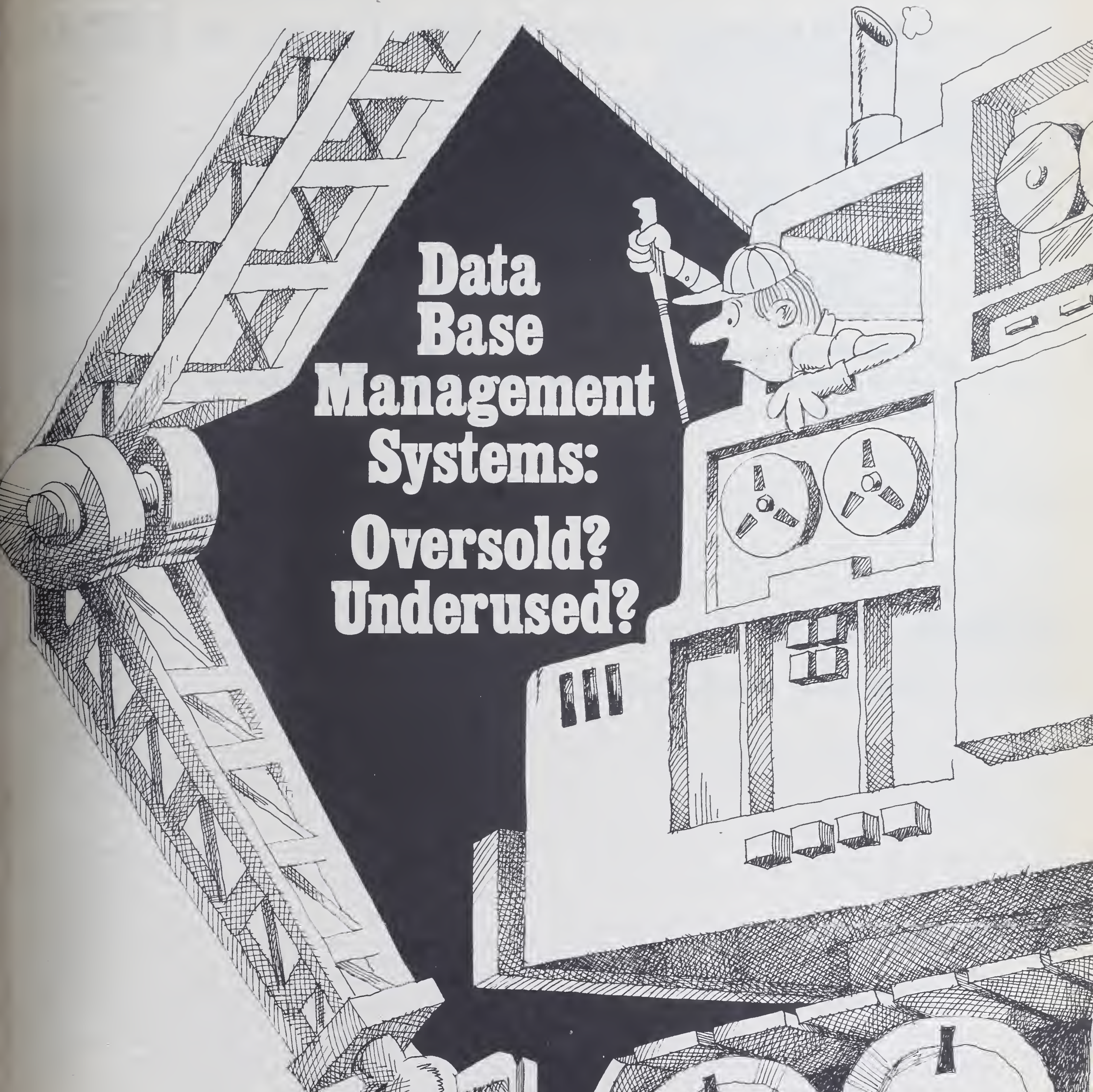

A COMPUTERWORLD SPECIAL REPORT

October 31, 1977

Edited by Don Leavitt

Growing Body of Users Stakes Hopes in DBMS

By Don Leavitt
CW Staff

Data base management systems have been part of the data processing scene for the past decade and users have been turning to them in growing numbers — and growing hopes — since the early 1970s.

The systems gained a reputation, probably deserved, as the way of the future — the way to overcome the frustrations and weaknesses of the conventional file-oriented ways of data processing. They seemed to coincide with the awareness that information management is more than data processing.

The benefits of the data base systems have been stated many times in the literature and in the ads of the growing number of vendors. In perhaps simplistic terms, they focus on three particular concepts:

- Data independence: Application programmers working with the DBMS no longer need to be concerned with where or how their data is stored, or if the data base itself is modified or extended.
- Reduction of data redundancy: A central depository of data generally means there is a need to maintain only one copy of any particular element. This hopefully leads to easier maintenance and more assurance that all applications working with the element have current and consistent value for the element.
- Making data available for other uses: "A growing base of data for a growing ease of users" has long been a phrase that held the greatest hope for the installations that installed these new-fangled systems.

Those benefits had to become realities if the installations and their managers were to cost-justify their acquisition of the data base systems. They cost substantial amounts of time, money and effort to get up and running. The overhead they impose on the whole DP operation is also substantial and has to be offset by real gains.

But what often happens — and you can sense it in some of the stories in this special report — is that the implementing organization gets overwhelmed with the effort expended on the first application. They may in fact have cost-justified all their expenditure with that application. But they tend to hold back on the followup exercises that would add to the credit side of their data base ledgers with much less of an impact on the debit side.

The tone of this report is generally optimistic. All the stories were volunteered and most of the authors are positive in their opinions — with one or two articulate exceptions — about DBMS, but, as in other special reports earlier this year, the stories are particularly useful because they concentrate on the work needed to get the systems in place rather than on the "glorious new life" they will provide.

It seems clear most of the authors would appreciate comments on their thoughts and their experiences. Letters or articles stimulated by this report would be welcomed by CW.

Data Base Provides Business Model

By Frank A. Dottore
Special to CW

The distinction between application systems and data base systems becomes more evident as a person gains experience with both.

An application system is an information model designed to produce specific output and which requires specific input. An information model is constructed to serve current information needs and to bring order to informational chaos by regulating flow and content.

The information model, used as an aid in business decision making, has been found to have many shortcomings which usually involve high costs, low efficiency and lack of flexibility. These problems have begun to draw management's attention toward data base concepts.

Data bases do not store information as information. They store data that can be used to generate information. They are, in effect, data models of a business. Data base systems, unlike application systems, either provide data to the computer or take it out, not both.

Data base development generally follows a path different from application development. Rather than automating function by function, data base development concentrates first on identifying what data should be stored in the computer. This base data is used to run the company. The cost and efficiency questions, which eventually lead to storage of parts of this data in a computer, can only be answered in terms of the cost and efficiency of doing business.

Control Functions

Data base development is performed in a data base management system (DBMS) organized around three basic control functions: a data base input control function, a data base output control function and a data base storage and processing control function. These three DBMS functions provide a new set of ground rules for automation, and the ground rules require that the concept of individual computer applications, each with its own input, storage and output, be abandoned.

Data base management systems, which collect and manage input to a data base, have as their primary purpose the maintenance of data quality and integrity. They are not concerned with the ultimate use of the data. They are constructed to capture data at its source, regardless of whether that source will ever see the data in the form of output. They provide input techniques, edits, audits, security and diagnostic controls intended to optimize data quality, integrity and cost.

The data base input control system, once established, undergoes few changes because it is not directly related to the company organization structure or individual management policy. If it is properly constructed, it will be affected only by the requirements for more or less data of higher or lower quality, or by changes in technology that would make data input more efficient or economical.

The data base output control function operates differently from the input function, as it is related to both company organization structure and specific management policy or directives. Data base systems that receive and use output are the most dynamic systems in the company because they answer questions developed for management decision-making needs.

Changes in these needs can be affected by almost anything, including personalities, management styles, economics, politics, changes in func-

(Continued on Page S/12)

Multiple DBMS Operate With Little File Redundancy

By Don Caskey
Special to CW

ATLANTA — A Catholic college preparatory school here has implemented three separate data base management systems (DBMS) on its Hewlett-Packard mini to greatly expand services to its faculty, alumni and students.

Ease of operation and low acquisition cost were major considerations in Marist's decision to go with separate DBMS software for each application. Data currently stored on-line includes alumni records (2M bytes), college selection information (3M bytes) and extensive demographic and academic records on the school's 800 seventh-through 12th- grade students (7M bytes).

A fourth data bank is slated to be operational this winter to service financial accounting applications and it will utilize still another DBMS. Even so, the school estimated data file redundancy is less than 10%, and software acquisitions are considered to be extremely low by market standards.

This fits the schools DP objectives and resources for several reasons.

First, disk space, though carefully supervised, is not a critical operational factor. The 77-year old school acquired its slightly used HP 2000F time-sharing system three years ago. It has 32 time-sharing ports, a 32K-word CPU and an 8K-word IOP.

In the deal the school also received a 23.5M-byte disk drive. This is an "overconfiguration" by many educational users' standards, but it permitted development and acquisition of DBMS software without the pinch for space that forces many users into costly and time-consuming coding, packing and unifying software development projects.

Even with the added financial package, the school plans to continue to provide space for student programs, computer-aided instruction (CAI) and drill practice lessons, a several-hundred-program public library, departmental inventory files and space for off-campus users (which this year included three colleges, three high schools and a guidance center).

Since the school has only one professional DP staff member (and even he has other administrative duties), a high priority for a DBMS was minimization of software development and user training time.

Little Training Needed

HP gave Marist its alumni DBMS with the system, and although the software (called Findit) was written to handle a number of different applications, the examples used throughout

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On the Inside

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Data Dictionary	Vendor	DBMS
Cincom Data Dictionary	Cincom Systems	Total
Control-2000	MRI Systems Corp.	System 2000
Data Base Directory	Eastern Air Lines, Inc.	Total
Data Catalogue	Synergetics Corp.	IMS, Total, Adabas
Datamanager	Management Systems and Programming	IMS, Total, Adabas, IDMS
DB/DC Data Dictionary	IBM	IMS
Integrated Data Dictionary (IDD)	Cullinane Corp.	IDMS
Lexicon	Arthur Andersen & Co.	IMS
UCC TEN	University Computing Co.	IMS

Listed above are the most prominent data dictionary packages currently on the market. The offerings of four DBMS vendors are evident; the remaining packages are offered by independent sources. Several mainframe vendors besides IBM also offer data dictionary capabilities in conjunction with their DBMS.

'Data Dictionary System' Needs Its Own Definition

By Ronald G. Ross
Special to CW

Over the past several years, data base administrators (DBAs) have begun to identify a number of areas in which the creation and management of data bases can be facilitated. Although there are probably as many opinions on the subject as there are DBAs, much of the discussion centers on what is rightly called the data dictionary problem.

Three functional areas are likely to be addressed by a data dictionary system. The first of these has to do with the design of data base systems; a data dictionary that assists in this area may be called a design aid.

In this interpretation of the data dictionary problem, the data dictionary serves as a repository of information collected during the analysis that leads to the creation of the data base. Such information typically includes the definition of data elements, estimates of usage frequencies, delineation of security requirements and so forth.

Subsequent to implementation of the data base, this information serves both as documentation for the system and as a base line for monitoring changes in usage patterns and data requirements. If these changes are extensive, then the data dictionary may serve as a redesign aid.

A second functional area is in the actual implementation of data base systems. A data dictionary can provide a number of services, which collectively improve the productivity of data base administration and programming. Such services might typically include data base description, subschema generation, data description for application programs and similar functions.

Significantly, these services are supported not only during the implementation of a data base system, but subsequently as well. In this manner, the data dictionary becomes a tool in facilitating what is generally called system maintenance. (This is reminiscent of data base goals.) We can call this type of data dictionary capability administrative aids.

The last functional area is "in-line" operational aids. In this interpretation, the data dictionary becomes part of an executing data base manager and contains information that assists in scheduling jobs, verifying security, validating transactions, etc.

At the same time, statistics may be gathered on actual data base usage. Information of this type can be used to determine the need for reorganization, for redesign of the data base or even for reeducation of users.

These three functional areas are likely to be represented to varying degrees in any given data dictionary system. We have by no means covered all the possibilities: for example, some feel the data dictionary should intercede in the behalf of the end user to translate information requests into the

(Continued on Page S/10)

Further Readings

The following are some of the more significant publications that have appeared in recent years on the subject of DBMS. Also listed are some Association of Computing Machinery (ACM) periodicals devoted to that topic. Most of these items have extensive bibliographies which can lead the interested reader into the journal literature.

ACM, **Data Base Management Systems, Comp. Surveys,** 8 (No. 1), March 1976 (Special issue on DBMS)

ACM, **Transactions on Data Base Systems**

ACM, **Data Base — A Quarterly Newsletter of the Special Interest Group on Business Data Processing (SIGBDP)**

ACM, **Proceedings of Workshops of Special Interest Group on File Description and Translation** (SIGFIDET) (Now SIG Management of Data-SIGMOD)

J.L. Berg, (Ed.), **Data Base Directions: The Next Steps:** The National Bureau of Standards (NBS SP-451), 1976

Codasyl Systems Committee, **Selection and Acquisition of Data Base Management Systems,** ACM (1133 Ave. of the Americas, New York, N.Y. 10036), 1976

Codasyl Systems Committee, **Feature Analysis of Generalized Data Base Management Systems,** ACM, 1971

C.J. Date, **An Introduction to Database Systems** (2nd Ed.), Addison-Wesley, 1977

B.C.M. Douque and G.M. Nijssen

(Continued on Page S/10)

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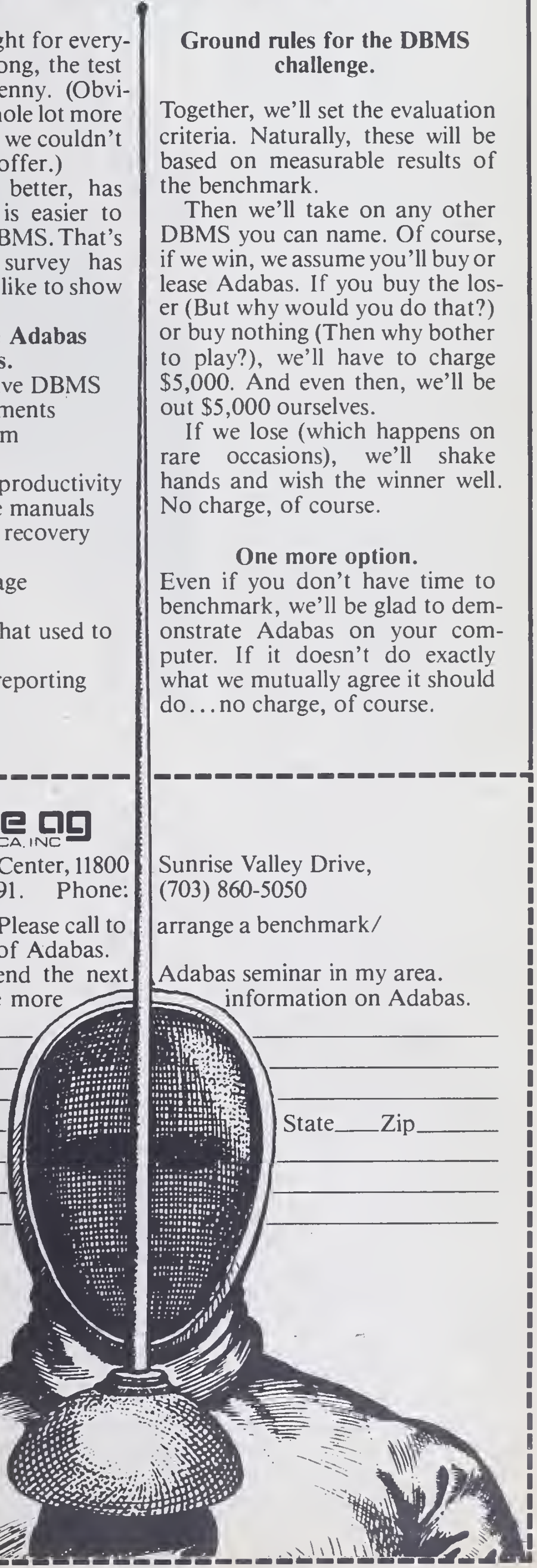

Beware 'Cure-All' Pitch From DBMS Vendors

By Patrick J. Cox
Special to CW

"You need a data base management system (DBMS) package now! Your traditional file organizations are outmoded. We'll give you integrated data, nonredundant data, data independence, infallible data security, custom views of data, perfect backup and restart and then we'll link everything together in a miraculous way that will enable upper management to snap their fingers and make fantastic ad hoc reports appear in minutes. All this plus it maintains itself! That's why we call our DBMS package Magic. Yes, Magic, Monolithic Aggregation of Gigantic Information Capability. Don't wait! Order now! We'll plug in Magic today and you can fire your entire data staff tomorrow."

This portrait of a software huckster is deliberately unfair. In the last few months, however, I felt like the object of such oratory.

I've looked at several DBMSs. I'm now convinced that DBMS is not magic or revolutionary and some people need it and others don't.

Everything Has a Price

To avail ourselves of all the things some vendors promise we must be willing (possibly) to increase on-line storage, process slower, employ a Data Base Administrator (DBA) and do a lot of solid front-end research into our current and future information needs. Also we must be ready to spend between $25,000 and $75,000 for the DBMS and its options (available at proportionate rental rates).

Opinions on the requirement for a DBA run the gamut from none needed to the other extreme, a 25-hour-a-day superman with all encompassing technical and business expertise who is empowered to single-handedly run the company. The good data base requires a competent overseer and the superman cape is impossible to fill, so realistically you use a senior systems analyst. With a sophisticated information system the DBA position will be a full-time one. You've just added $20,000 plus a year to your data base budget.

Congratulations if you meet your schedule. It's possible, especially if the front-end work was ready before the purchase or lease of the DBMS. As often as not, however, the front end is not completed. It seems to be all there in the file layouts, print formats, etc. But then the first "Abracadabra" field surfaces.

What is this field? What does it do? It must have a function, the existing system runs with it. No one seems to know. You read program listings and there, finally, is a reference to it. Personnel uses it as an anniversary date for employees of XYZ company that merged with us 14 years ago. Unfortunately, it's used under another condition with a totally different meaning elsewhere in the system.

Several "Abracadabra" fields appear as we're building our data base. We'd better get together with all levels of management and clarify these multiple meaning data fields. This might take awhile; we'd better let everyone know that the project will be a little late.

Let's take another tack though. We'll assume we've really got a handle on what is in our old data files and what each element is used for. All we have to do is interrelate data elements. At the same time we'll eliminate all data redundancy. Let's just tie things together in the data base with paths similar to the old ones, but of course more efficiently because they're maintained by the DBMS.

But wait. We're supposed to open up endless reporting avenues to the company. Better get together with management and find out what the company really wants and what the priorities are. This might take awhile.

Finally we've got data elements that are clearly defined, data paths that form every conceivable information requirement, absolute nonredundancy of data and all of this combined with the DBMS supervised data independence. The DBA can give the programmer the elements and paths he wants him to have. To the programmer it will appear all elements are independent. But the DBMS must

(Continued on Page S/16)

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Via On-Line Retrieval

Network Users Access Predefined Data Bases

By Tom Gregory
Special to CW

Information on every subject new and old is piling up worldwide at an ever increasing rate. The time consumed and the money spent in the traditional library search for specific information can become the single biggest element in any endeavor. Out of date, out on loan, lost or incomplete references and the realization that the information needed for review is in a library 100 miles away can completely frustrate most research.

Contrast that with sitting in front of a terminal connected to an ordinary telephone in the comfort of your home or office and being able to search through millions of individual references, review the most promising, redirect a search based on something just uncovered and find the specific information required in just a matter of minutes. This is the world of on-line information retrieval utilizing commercially available data base systems.

An on-line data base system is a vast and continuously updated file of information that can be remotely accessed by ordinary low-speed CRT or teletypewriter terminals over common phone lines. Individual data bases can contain many millions of references or items of data. There are two general types of on-line data base systems, numerical and bibliographical.

Numerical data base systems consist of files of numerical data coupled with a software system that allows for the search, isolation, retrieval, display and further manipulation of the retrieved data by means of some computational routine.

Bibliographical data bases contain references or summaries of articles, books, completed or current research, dissertations, papers and other kinds of information on a particular subject or subjects. They are designed so that by using a subject heading, a key word, a key phrase or an author, one can search for, sort, review and then print any part of a citation contained in the data base.

Most retrieval services offer an off-line, high-speed printout, usually mailed that same day, for the long bibliographies.

Data bases are typically developed, expanded and supported by an agency different from the information retrieval or time-sharing service that makes that data base available. Some of the more popular data bases are available through three or more such services and as high as 18 different vendors in the case of the National Bureau of Economics Research data base.

Hundreds of data base systems are commercially available, and there are many more out of the public domain with access limited to university faculty and researchers, scientific and technical organization members and other such groups. The federal government has over 4,000 scientific numerical data bases, some of which are available to the public by special arrangement.

Many new data bases are going on-line every month. The average data base is broadened in coverage and content and updated on a weekly or monthly basis. The current events or news-oriented data bases are literally up to the minute.

On-line data base systems are available from various kinds of vendors. There are firms calling themselves retreival services with multiple CPUs, gigantic storage capabilities and upwards of 30 or 40 different on-line data bases. Many general time-sharing firms offer one or more data bases as a part of their service, and there are small firms with their own network-coupled comptuter offering only one highly specialized data base.

system consists of terminal rental, telephone time, training, time spent on the terminal and off-line printing expenses. Most vendors provide local phone numbers through

(Continued on Page S/18)

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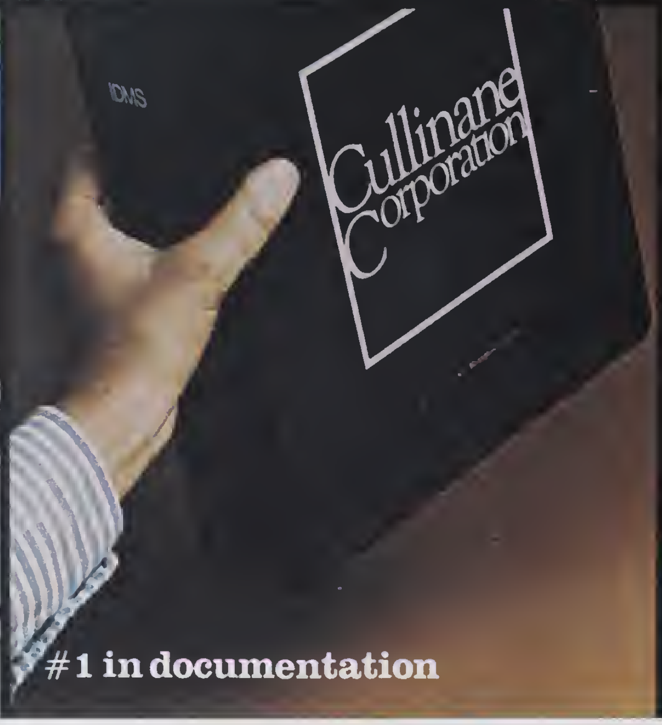

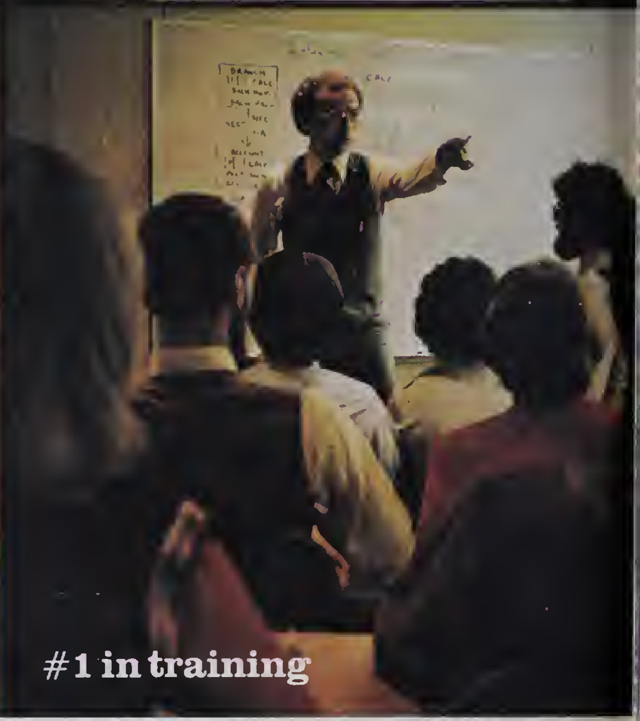

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With the Trend to Distribution

Standards the Key to Data Base Interworking

By Frank E. Taylor
Special to CW

The last decade of computing history has been marked by a clear trend toward the greatly increasing use of on-line communications between user-driven terminals and computers and, more recently, between computing subsystems. This includes communication between mainframes where necessary, often as a much faster and efficient alternative to the use of off-line communications such as the transfer of magnetic media, and also between complementary subsystems such as those found within distributed systems.

Growing pressures on system designers are focusing attention on the alternatives of physically distributed portions of a data base which is logically one entity, or the replication of a master data base at several locations. This paper is primarily concerned with data base replication rather than distributed data bases.

It is timely to consider the means for transferring data bases between locations, and particularly between processing subsystems of differing manufacture, before such transfers become a necessity. When they do, we will inevitably find that we have a ready-made facility (if the profession has done its spadework effectively or we will have yet another bottleneck limiting the performance and effectiveness of systems.

File Interworking

Within a number of today's distributed systems, files are replicated in two or more interacting subsystems. In some systems such interaction only occurs on a daily basis. In the UK, one state-of-the-art distributed system involves a master computer that calls up intelligent minicomputer-based remote subsystems one by one.

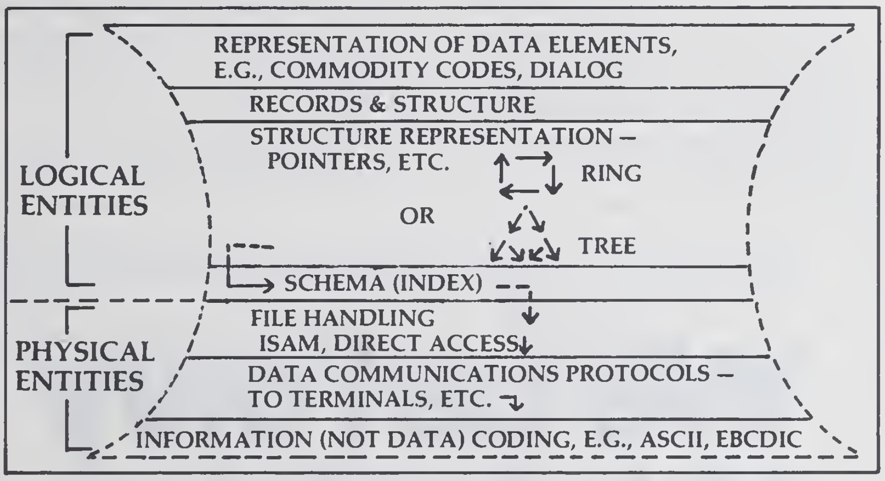
Today's transactions are summarized and fed to the master computer for administrative purposes. Then the communications link is turned around and information generated by the head office is distributed by the master computer for use next day — e.g., price changes, staff instructions, etc. Interworking at the file level is thus with us, although UK experience shows it is relatively restricted to intracompany systems, ie., systems serving only one company.

Interchange Requirements

When data bases are to be interchanged between differing subsystems — differing either in scale, size or manufacture — then there are two solutions. First of all, compatibility can be provided between any two subsystems by processing information within one subsystem in such a way as to make it compatible with the other.

This is often a relatively cheap solution to implement, although one which clearly has restricted application — normally with only two interlinked systems — and one which can rapidly increase in complexity if, within any one intercommunicating system, compatibility packages have to be provided to convert to the requirements of several other subsystems.

The other solution, initially more costly unless it is adopted by a large number of users, is standardization across the board. In the longer term, this is a much more satisfactory and economical solution. No standards yet exist for the general interworking of data bases, and in the remainder of this paper some other requirements will be examined in detail, as well as the state of progress.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RING
OR
TREE
SCHEMA (INDEX)
FILE HANDLING ISAM, DIRECT ACCESS
DATA COMMUNICATIONS PROTOCOLS – TO TERMINALS, ETC.
INFORMATION (NOT DATA) CODING, E.G., ASCII, EBCDIC

Data Base Transfer — A Superset of Standards Requirements

Data base transfer involves examining a number of attributes of information, relating to both the logical structure of data and its physical structure and handling. The logical entities include the following, although the list is not exhaustive:

- Standards for the representation of data elements, e.g., commodity codes, dialogue elements when standard transaction processing systems are used, etc. This area also extends to include standard messages, an area where work is just beginning.
- Standards for the sequencing and representation of information records within logical blocks, e.g., data definition languages and data manipulation languages, an area already attracting considerable attention, but not considered further here.
- Some form of shorthand representation of structure, i.e., hierarchical structure or network structure, sometimes alternatively termed "tree" structure and "ring" structure.
- Assuming the structure is known, then some form of index or "schema" must be transferred from one system to another — ideally using the same standards.

Physical entities complement the logical entities and include the following:

- The means used for file handling, e.g., index sequential, direct access or a combination of hierarchical methods and either of the preceding methods.
- The data communications protocols used in the widest sense — including the line level, the link level, the packet level if present and the means used to plan and manage transfers.
- The lowest level is one which is still important, although not only in the data base area. It is the codes used for coding information. Examples are Ascii and Ebcdic, which, as is well known, are not particularly compatible with each other.

Progress to Date

Some progress has already been made in standardization circles, to fit into the structure just outlined. For example, considerable progress is now being made toward the production of file labels that can be used to label the structure and contents of files within a given type of medium.

However, cross-media labeling standards have not yet been developed, and some conversions will be necessary between, for example, standards used on an exchangeable disk store and standards used within a collection of floppy disks.

In the communications area, here in Europe the Euronet information handling system, due to start work in 1978, is regarded as the pioneer system that will enable a number of protocols from the packet level downwards (including link and physical levels) to be tested in a live environment. The X25 interface, which was recently aligned with ISO's HDLC standard (Geneva, April 1977), provides a standard that embraces packet, link and line levels.

However, there is something of a credibility gap between the packet level, looking upwards, and the very few standards that exist within the higher level protocol area — e.g., the file label standards just mentioned. This is an area which needs to be urgently considered, in such a way that existing standards for information coding (where ISO has been active for some time), file labeling, data element representation and hopefully in the near future message representation can be incorporated into overall standards for the higher levels of protocol.

These will enable data bases to be transferred between systems on an open basis — providing "open systems interworking" — a phrase now frequently heard in Europe, and one which has attracted the attention of ISO, which set up TC97/SC16 in March of this year to study requirements. This area presents a tremendous challenge, but is an area where tremendous benefits will result from standardization — if it can be achieved in time, before a vast number of proprietary differing implementations and compatibility aids become reality.

Taylor is a consultant with the National Computing Centre, Ltd., Manchester, England.

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'Data Dictionary' Needs Its Own Definition

(Continued from Page S/3)

structural data required by the DBMS. (Does this fall under administrative aids or operational aids?)

Nonetheless, we have seen enough of the data dictionary system problem to formulate practical definitions. A data dictionary is a repository of information about the data base system; a data dictionary system uses this information to perform one or more of the functions discussed above.

Sources of the System

Who should implement the data dictionary system? There is an undercurrent of feeling in some quarters that the facilities we have identified with the data dictionary problem should, in fact, be integral to the DBMS. This is not necessarily to condemn current DBMS, but rather to say that there are important areas into which they could be evolving.

A merger of the data dictionary system with the DBMS is not difficult to envision. For example, subschemas contain considerable information about data usage, program security and the like. Also, it is easy to view "operational aids" as areas in which DBMS software could be upgraded.

Be that as it may, the data dictionary system as an in-house application system has been the rule in the past. The reasoning is simple: the implementation of a data dictionary system provides an excellent training ground in the technology of a newly acquired DBMS. It eases the transition to the data base environment and it represents low-risk to the corporation, since production systems are not directly involved. A data dictionary system is the perfect "first" application.

It turns out that this route is not always as rosy as it might appear, but even partial success (or partial failure) can be an important lesson to the DP department.

Finally, a data dictionary system can be acquired as a package, much as the DBMS itself. There is an increasingly good selection of commercial packages on the market. An important advantage of this source for a data dictionary system is the fixed cost of implementation — something not associated with the in-house route.

Also, commercial packages often address the specific shortcomings of the DBMS they support (important especially to Total and IMS users). Since they are generalized, however, they may be less well attuned to specific in-house needs.

Internal DBMS Support?

An additional question is often raised: Should the data dictionary be implemented using the DBMS for internal support? In other words, should the data dictionary be a data base like all other data bases? In-house data dictionary packages do as well. (IBM's DB/DC Data Dictionary is a prime example.)

The DBMS does, in fact, offer a significant potential for cross-referencing information in the data dictionary. A disadvantage, however, is that it restricts usage of the data dictionary system to only those environments where the specific DBMS resides.

Some attractive commercial systems avoid using the DBMS internally for just this reason and substitute their own quite impressive data management facilities instead.

Is a data dictionary system that is independent of any specific DBMS good for all others? (We might call this the universal data dictionary.) Given the variety in DBMS, it is difficult to imagine that this could be the case.

Ross is a member of the senior staff at Performance Development Corp. in Princeton, N.J.

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(Continued from Page S/3)

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Automates Shop Floor

TRW Teams With DEC for Mini DBMS

By Frank Cope
And Judi Suderman
Special to CW

EL SEGUNDO, Calif. — The manufaturing facilities of TRW's Defense and Space Systems Group represents a functionally and geographically diverse environment with both electronic and mechanical manufacturing. Although the manufacturing function is surrounded by a fairly high degree of automation, shop floor status and control procedures have remained essentially manual. The one exception was a DPI labor collection system. At the same time, shop operations provided a significant amount of input to other systems frequently entering the same information to multiple systems.

Late in 1975, the decision was made to automate manufacturing with the initial effort being in shop floor operations. Proposed operational requirements were 24 hours per day and 7 days per week use of the shop.

TRW had dual IBM 370/158s and checked whether they could be used, but found them to be unacceptable since it would take too much time to reprogram and cost too much to expand the hardware. The next approach was to use a distributed minicomputer.

Finally, the decision was made to use a stand-alone dedicated minicomputer with a remote job entry (RJE) link to the IBM mainframes and a real-time interface to the DPI-data collection system (badge reader).

The next step was to select a vendor and configuration for the proposed system. An evaluation team was formed which included applications specialists, business and scientific minicomputer specialists and a user representative from the manufacturing area.

The team developed a set of evaluation criteria that included hardware capacities, operating system functions, network and terminal management capabilties. This criteria was applied to more than 10 models of minicompuers and the Digital Equipment Corp. PDP-11/70, Hewlett-Packard HP 3000 and Prime Computer, Inc. 400 were selected for further study. A series of benchmarks was developed and each manufacturer was visited for orientation and test execution.

In the final evaluation, the primary factors considered included operating system performance, hardware cost, number of units installed, delivery schedules and the degree to which initial configuration could be expanded. Particular emphais was placed on performance and expandability.

The final selection was a PDP-11/70 with 512K byts of memory, three 88M-byte disk drives and 22 terminal devices.

As the detailed program design emerged, it became more and more obvious that some type of data management scheme was required for the application. The initial approach called for developing the data handling capabilities as part of the applications program. The file management approach of each manufacturer was given particular attention.

It was about this time that three key situations came to light. The data relationships and structures were becoming increasingly complex; Cincom was advertising a version of Total which ran on a PDP-11/70 under IAS; and DEC was about to release its own DBMS for beta test.

After extensive evaluation, including an on-site demonstration installation by Cincom, DEC's DBMS-11, a Cullinane IDMS adaptation, was selected for beta test and implementation, since it provided a broader range of functions and capabilities. TRW also felt that long-range support and operating system compatibility would be enhanced with a hardware vendor-supplied product.

A DBMS development team was formed, consisting of a team manager, a DEC software specialist, four system designers and nine technical programmers. The team was responsible for the system design, application development, data base administration and operating system support. Two people from the user group were in contact with the development team.

The initial data base was designed, coded and implemented in four weeks by the DEC specialist and a TRW system designer. This speed was in a large part due to extensive use of the Codasyl hierarchical network data base which features flexible set linkages, set membership options and set retrieval options.

Three months after the implementation of the initial data base, Phase I went into production. The Phase I data base consisted of 13 subschemas, 19 record types, 21 sets and five areas. Phase II, with a data base of 40 subschemas, 62 record types, 56 sets and nine areas, is now being programmed.

The TRW choice of DEC DBMS-11 has satisfied the user need for a short implementation schedule, low equipment cost, expandability from six to eight additional manufacturing shops and system reliability.

Cope is the project manager at TRW in charge of the DBMS evaluation and installation described here; Suderman is his counterpart on the project for DEC.

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Data Processing Manager
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November			
Portland, OR	Tues.	Nov.	1
Indianapolis	Wed.	Nov.	2
Des Moines	Wed.	Nov.	9
Boston	Thur.	Nov.	10
Rochelle Park	Tues.	Nov.	15
White Plains	Thur.	Nov.	17
Philadelphia	Tues.	Nov.	22
Houston	Tues.	Nov.	29
Albuquerque	Wed.	Nov.	30
December			
Miami	Thur.	Dec.	1
Cleveland	Tues.	Dec.	6
Pittsburgh	Thur.	Dec.	8
St. Louis	Tues.	Dec.	13
Cincinnati	Thur.	Dec.	15
January			
Detroit	Tues.	Jan.	17
Columbus, OH	Thur.	Jan.	19
Memphis	Tues.	Jan.	24
Washington, DC	Thur.	Jan.	26
Kansas City	Tues.	Jan.	31
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Nashville	Thur.	Feb.	2

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With Added Software 'Layer'

System Simplicity Gives Control Over Changes

By Glenn B. Harvey
Special to CW

Most computer service managers will agree that their control over changes is much less than they would like and that their lives would be easier if a better way to exert control could be found.

Many systems, of course, have been developed, advertised, installed and used with great shouts of success. These include retrieval systems, query packages, operating systems, compilers, file access methods and more generalized systems support.

At DePaul University, we examined many such systems, starting in 1971. The data base package selected was Total from Cincom Systems because of its low cost, minimum memory requirement and well-established market position.

But Total did not appear to offer the answer to changes without some additional control apparatus, perhaps a new layer of software between the data base package and the application program. We had read about data element dictionaries and table-driven systems. These ideas appealed to us, but we had misgivings about our ability to develop them effectively.

We learned Amherst College in Massachusetts had developed an embryo generalized maintenance and retrieval system using Total for the data base. It was a dictionary-driven system that worked well.

High Expectations

We elected to build the DePaul data base with the foundation provided by the Amherst system. We recognized our own peculiar problems along with those of other shops with which we were familiar. In any case, we created new software, which we call the Application Control System (ACS), and which was meant to be responsive, flexible, simple, self-documenting, parameter-driven, user-controlled, easily converted and economical.

Initial hardware for ACS was a 96K IBM 360/30. This was followed by a 192K 370/135 and, last February, by a 512K 370/138. We provide services for administrative users throughout the university. The data base, including ACS, has been fully operational for over four yars and we consider it an unqualified success.

ACS can be called a data management system by some definitions. It

(Continued on Page S/21)

Data Base Gives Business Model

(Continued from Page S/2)

tional responsibilities and so on. Thus the output control function must be geared primarily to support output demand.

Data Remains Constant

Rarely in a properly developed data base should changes in output requirements cause changes in the data base input control function. This is usually because the information required to satisfy 80% to 90% of management's decision-making needs is, in most companies, developed from combining, arranging, analyzing, sorting and reporting the same basic data elements. From the same basic data elements, thousands of different demands for output can be supported.

In addition to the generalized input and output functions, a data base will be supported by a storage and processing control function. This function manages the data base itself, receiving data from the input control function and passing it, on demand, to the output function.

The processing and control function is an independent data base management function with built-in capabilities for controlling backup, recovery, data availability, security, computer efficiency, etc. It is generally controlled by an individual called a data base administrator.

The processing function also controls the data base's physical structure. This structure is not static. It must respond to needs for optimizing efficiency and cost-effectiveness.

The control function is not completely free from data redundancy. Redundant data is purposely used to improve computing efficiency and reduce processing time and costs. The processor employs data base management software to maintain data independence and to provide maximum control over the physical structure of the data base.

The storage and processing function reflects the basic work structure of the company. It represents internal departmental functions and recognizes the logical interrelationships between departments. Its view of the company is the one that recognizes all the intricacies of how work flows from department to department in terms of basic activities and tasks.

Yet in a very real sense, the processing and control function ignores departmental boundaries, concentrating instead on tracking and logical relationships among work tasks and their related costs and schedules.

Dottore is a systems project leader at St. Regis Paper Co. in New York City.

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The brain is the original software system. It's been around as long as man.

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Above all, it has already achieved the ultimate goal of other software systems— the brain's problem statement is its program.

However, the brain does have drawbacks. It can't handle enough data and it's too slow.

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RAMIS II is a software system that offers many of the brain's capabilities without its limitations.

Like the brain, it's a DBMS. The only DBMS besides the brain that lets you specify what you want in English without having to specify how this information is to be obtained.

And like the brain, RAMIS II lets you access information even if you don't know how and where the data is stored. RAMIS II knows and that's enough.

This means that if you're a DP professional, you can design whole systems in one-fifth the normal time. And if you're a manager, you can access corporate data bases, ask those 'what-ifs' as needs arise, without putting undue pressure on the DP staff.

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Users Urging Move to Data Base Distribution

By Grayce M. Booth
Special to CW

Information systems have become increasingly data base-centered over the past few years. Originally the focus in information processing was on computation; today it is on the generalized storage and manipulation of data. The typical state-of-the-art system today supports on-line access to a large data base shared by many applications and many terminal users.

The key to the success of these systems is the integrated data base, whose organization can be structured to model real-world data relationships. Charles W. Bachman — then of General Electric and now of Honeywell — first embodied this concept in the Integrated Data Store (IDS) software in the early 1960s. Since then, vendors and users have invested large amounts of time and money in researching and developing centralized bases integrating data from multiple functional areas.

Today users are learning to live with data bases, working with vendors to gradually resolve the technical challenges they present — overhead, complexity and control.

As usual, however, the information processing community is eager for new and better capabilities, and the cry "distributed data bases!" is arising with increasing frequency.

The current popularity of minis, and the resulting trend toward distributed processing, leads naturally toward distributed data bases. But this term — like "distributed processing" — means many things to many people.

Ideal Distributed Data Base

Ideally, the user would like a distributed data base to be a "virtual filing system." Data would be stored at many locations, but with any data element equally accessible to any authorized user at any location. The user would know nothing about the distribution of the data. Elements stored in Hong Kong would be as readily accessible as those stored at a local center, possibly with slight delays due to long-distance transmission.

While intriguing, the "virtual filing system" remains impractical until certain major breakthroughs are made.

First, data communications technology must provide higher speed transmission at low cost and with low error rates.

We will have to learn how to partition an integrated data base across multiple locations, how to handle complex error and recovery situations, how to control multiple users of the data base and how to provide the needed levels of data privacy. These must be explored in depth before "virtual filing systems" become commercially available.

In the meantime, of course, there are practical ways of building distributed data bases within today's state-of-the-art to meet the current needs of applications such as on-line banking and manufacturing control.

Taking a closer look at distributed system trends, they center around the tie-in of minis to larger host computers. Many users have medium- or large-scale computers to which they may be connecting minicomputers to combine the power and capacity of the general-purpose computer with the convenience and simplicity of the mini.

In systems of this type there is a typical progression in the use of minis. The first step is often mini-based data-entry terminals, providing editing and formatting capabilities. At this stage the data base remains centralized at the main — or host — computer.

The next step frequently involves building a small read-only inquiry data base at each mini, so that the mini becomes a satellite processor. Typically, the data at each satellite processor is a partial copy of the host's data base, forming a replicated distributed data base.

As long as the data stored at the satellite is used for inquiry only, the problems of distributed data base update synchronization can be minimized by refreshing the local data once a day from the host data base. Since many on-line applications are active only during daytime hours, it is often convenient to refresh the data

(Continued on Page S/18)

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To the executive who knows a DBMS is not a German sports car:

You're concerned about database management. You know that a standard CODASYL-compliant DBMS is a must. It's the only way many separate though related data entry and processing functions are ever going to be tied together in an integrated system. In other words, you've gone beyond asking "What if?", and are trying to answer, "How?"

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PRIME

Prime can help

Beware Vendor's Pitch — DBMS Not a Panacea

(Continued from Page S/4)

somehow find the elements requested, on a series of files organized (suspiciously) a lot like the old traditional files.

Remember, however, we got rid of all that nasty redundancy; so the DBMS does a few extra "gets" to procure some fields that might have already been present in the traditionally redundant file. The program also needs to add elements to a file and this requires, although transparent to the programmer, that physical records be added to the files. The DBMS must then update linkages amongst its other duties. This all takes time.

Request Comes In

Now that everything is out on our data base and our DBA is in complete control and we're reconciled to the trade-offs we've made with processing efficiency, we're ready to tackle ad hoc requests.

A vice-president asks for an unusual report. Alas! The programming staff is busy on a priority project. It is two days before work can start on the unusual report and it takes another three days to code, test and debug the program and another day to get it into the operations schedule.

Enters the vendor: "If you had purchased/leased our Super Inquiry Language Translator (Silt) your vice-president could have written his own program and had it executed without even being compiled. Of course, to be effective, Silt must be supported by Data Ultimate Definition Encyclopedia (Dude) so that the end user knows what stuff he's working with. It would have only cost you another $20,000 to $25,000 over our base sticker price, for both."

Outside of the cost, it sounds like a pretty good idea. Unfortunately, the vice-president doesn't want to learn how to write things such as, "(IF HIRE-MO > 7 AND HIRE-MO < = 12 THEN WRITE ELSE BYPASS)" or "(BRANCH H '36' DROP)." So the job falls to the programmer who still can't start on it for two days. It's easier to write with Magic-Silt-Dude but all of the steps associated with developing a traditional program still exist to some degree.

The vice-president is inclined to say, "Why the heck did we spend several thousand dollars on Matchtrick, Slit and DUD anyway?" Why indeed?

Who Needs It?

The key, I think, is that anything DBMS can do, the well-designed traditional system can do just as well if in a different way. There are many computer centers doing fine with the "old" methods.

Wow! DBMS is really worthless!

Not true. There is a case for DBMS packages. The basic tools are packaged and ready to use if you determine you need them.

Ask yourself a few questions:

- Are we in trouble with our current data management patterns?
- Do we anticipate growth that will make our files, programs and overall system considerably more complicated?
- Do we spend a large amount of our time on program maintenance?
- Are we backlogged on new applications and/or ad hoc requests?
- If we develop a positive plan to improve information processing will we be afforded the required time and resources to implement it properly?
- Would management be able to truly dedicate sufficient time to a redesign effort?

How to weigh your answers is self-evident. Depending on the severity of your particular problems you may legitimately opt for DBMS.

If you want DBMS, consider a few more things. Your staff must be receptive to change to a new concept. You must have a firm commitment from management. Your original DMBS application should be a fairly small one, allowing your staff to build expertise gradually before attacking bigger game. Get the front-end work done before delivery of the DBMS package.

But remember, a DBMS can't be installed overnight and it's not a panacea.

Cox is a systems analyst in information services at Associated Freightways, Inc., Grand Rapids, Mich.

Distributed Confusion

There are almost as many approaches to distributed processing as there are computer companies offering them. By letting your needs dictate the right solution, Hewlett-Packard can help you clear up the confusion.

You already have a large EDP investment. The last thing you need is a distributed data processing plan that makes your present operation obsolete. Or that will be out of date itself in a few years.

At Hewlett-Packard, we've worked out several ways to simplify the problems of putting your computer power where the work is. Our systems can help you make the most of your system, let you computerize many functions you're now doing manually, and still give you central control through links to your big computer. And they're so versatile that they can adapt to future changes in distributed data processing.

This all-around performance makes the HP 3000 an ideal departmental computer. You can dedicate it to solving a wide range of problems such as order processing, inventory control, cost accounting and materials requirement planning.

You'll see a dramatic improvement in efficiency at your plant or sales office or distribution center. At the same time, you'll have a better data entry system with the capacity to edit and check data before transmission to the central computer. By reducing inaccurate entries, you can shrink your communications costs.

Our system is also easy to expand, either within a department or into a complete network of computers that share information and programs.

Putting an entire network of computers at your fingertips.

We've developed new software, DS/3000, that turns a series of HP 3000s into the simplest, most functional network available today. You can sit down at a terminal and use the programs, files and data in any interconnected HP 3000. You don't need a special program to do it. Simply identify the computer you want to talk to and you're on-line.

With the same ease, you can shift programs and files from one HP 3000 to another. And you can do local and remote processing at the same time.

Imagine how much faster remote sites can get accurate, up-to-the-minute information this way than they could by depending on the overworked central computer!

How a small computer handles big computer jobs.

The HP 3000 has versatile executive software that manages all the computer's resources. Advanced design gives it the speed and power needed to handle more jobs more quickly than comparably priced computers. (Our U.S. prices start at $110,000.)

While you're getting information from the computer on one of the terminals, the system can be running batch programs.

You can also use as many as six "big computer" languages, run large programs on our small system and develop software quickly and inexpensively. (A very important consideration when you look at the climbing costs of programming.)

The executive software is so advanced that it will remain the heart of our computers for years to come. So you can keep adding to your system without having to throw your old programs out the window.

And the built-in flexibility of the HP 3000 helps you stay up with all the latest trends, no matter what direction distributed data processing takes in the future.

The HP 3000: The system that makes it all seem simple.

For efficient management, you should have a computer system that adapts to your EDP set-up while handling those day-to-day departmental jobs you need to automate. The HP 3000 does precisely that. By forming a network of HP 3000s, each department can take care of its own workload and also share programs and data bases with the rest of the organization. At the same time, you can communicate with your big computer so you don't lose central control. What better way of avoiding distributed confusion?

Turning raw numbers into usable information.

Your big computer has data base management to consolidate related information into easily accessible files. This capability is just as important at remote sites.

It allows your key people to call up the facts they need instantly, and get them in an easily understandable form without wading through reams of paper.

The HP 3000 has an extremely effective data base management capability. With its help, the computer will generate forms, titles, page and column headings, data sorted by categories, subtotals, totals and averages. And, through DS/3000 software, you can call up any HP 3000 data file in your network.

Data base management on the HP 3000 has proven so efficient that it was recently named to the Datapro Software Honor Roll, placing it among the 38 top software products in the country.

It takes more than a good product to make it a safe buy.

Support has always been a top priority at Hewlett-Packard. For our computer customers, we have complete service before and after the sale, with on-site training and full documentation. Nearly 1000 Customer and Systems Engineers provide regular maintenance and give you applications and programming assistance. They work out of offices in 65 countries around the world, offering you efficient service at a remote location as well as at your headquarters.

So if you want to take the confusion out of distributed processing, now and in the years ahead, call your nearest Hewlett-Packard office listed in the White Pages. Ask for a Computer Systems representative. Or write for more information to Bill Krause, Hewlett-Packard, 11000 Wolfe Road, Dept. 304, Cupertino CA 95014.

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For Traders, Portfolio Managers

Bond Analysis Helps Simplify Securities Mart

Special to CW

NEW YORK — An interactive Bond Analysis System (BAS) that enables traders and portfolio managers to quickly spot favorable price/yield opportunities has significantly increased earnings for First Pennco Securities, Inc., an underwriter and market maker in fixed income securities.

In operation since February, BAS provides comprehensive monitoring of U.S. Treasury and Agency notes and bonds, selected money market instruments, mortgage-backed bonds of the Government National Mortgage Association (GNMA), Treasury bill futures and GNMA futures.

"Before 1974 there was no need for compterized capability in these markets, but the recent proliferation of issues has made it increasingly difficult to identify timely moves for better returns on investments," Dr. Joseph Bench, vice-president and economist for the firm, said.

The extensive analytical capabilities of BAS were developed on XDMS, an integrated data base management system provided on the time-sharing network of Interactive Data Corp., Waltham, Mass.

A general-purpose system, XDMS features a flexible English command language for defining, creating and maintaining data bases and screening data into a wide variety of formatted reports.

"We wanted the greatest flexibility possible in data base management and selected XDMS largely because of its random access capabilities and ease of operation," Bench observed.

Buy or Sell?

BAS is a fully conversational on-line system for analyzing historical trends, relationships and interest spreads among all issues in the data base, which contains daily closing prices and/or yields as reported by the various trading desks at First Pennco. Data can be screened by particular issues or by market sectors to uncover favorable buy and sell opportunities, plus advantageous arbitrage situations. (Arbitrage is a technique used to take advantage of price differences in similar securities, through buying an undervalued security and selling one that is overvalued simultaneously.)

For First Pennco, which does an annual volume of about $1 billion in arbitrage, BAS is bringing strong results. The firm's earnings for the first six months of 1977 were $1.4 million, compared with $1 million for the same period a year ago.

"In many cases, our annualized rates of return in relation to the amount of capital at risk have increased more than 100%," Bench pointed out.

A key factor in the success of the First Pennco system is its computerized model of historic fixed income spread relationships, which it says is the first to be based on executable rather than theoretical quotes.

Jack Hauptmann, First Pennco assistant vice-president who guided the development of BAS, noted the model is "a practical and finely tuned analytical tool for generating a continuous stream of recommendations for arbitrage situations."

With a minimum of typing input, users of BAS can:

- Generate daily closing quote sheets on U.S. Treasury notes and bonds and selected money market instruments.
- Display historical trading activity of any particular issue up to 250 consecutive days.
- Conduct historical spread analyses between any two issues, via traditional statistical measurements in tabular or graph formats.
- Obtain multiple yield curves on U.S. Treasury issues.
- Compute yield maintenance prices for trading in GNMA futures.
- Examine all available opportunities for maturity extension or maturity shortening.

"Starting with the daily executable quotes, anyone with a portfolio in the government or

(Continued on Page S/20)

Data Bases Moving Toward More Distribution

(Continued from Page S/13)

at the satellites each night.

The next evolutionary step may involve satellite data copies which are updated on-line. In this case, synchronization problems can be minimized by updating only the satellites' data base segments during the on-line day. At night, those same updates — possibly in summary form — plus any updates from other sources, are applied to the host data base.

On completion of this update, the satellite data copies are synchronized to match the host data base, and the system is ready for the next day's on-line processing. Of course, if there are no updates other than those entered at the satellites, there is no need for redistribution from host to satellites.

Distributed Software

All of these modes of use are well within today's state-of-the-art. However,they do require a capable set of data base management software at the host and the mini. This distributed data base software must include:

- Compatible Data Base Structures for the Host and Mini. Although the data base segments at the minis will not be as large, or as complex, as the host data base, the same structures are required at both. Otherwise, complex transformations of data and structure may be required each time information is moved within the system. The ideal situation is for the mini to support a compatible subset of the host's data base structures and access methods.
- Data Base Transmission. Distributed data base use calls for moving parts of the data base between computers. This may require a data communications capability for high-speed transmission (50kbit/sec or higher) between the host and mini. "Transparent" data movement must be supported, so that any code set — including binary data — can be sent. In addition, routines to transmit selected portions of records for update and/or selected records for replacement are desirable.
- Flexible End-User Facilities Today's distributed systems are oriented toward on-line applications and typical users are not programmers; they are "end users" who think of the computer as a tool, easy to use and quick to interface to the data base must be simple, flexible and geared to each application.
- Host/Host and Mini/Mini Interface. Although the main emphasis today is on the linking of minis to hosts, the capabilities just described make it equally feasible to configure a distributed system and data base using multiple hosts or multiple minis.

With compatible hosts or minis, the same data base structure is available at each. Data base transmission requirements are the same as for the host/mini tie-in. Finally, the need for end-user facilities is the same when multiple hosts or multiple minis are used.

Therefore, as a "fall-out" of the developments needed to support data bases distributed across a host/mini combination, there exists a capability to configure a distributed data base either on multiple medium- or large-scale computers or on multiple minicomputers.

One probable evolutionary step in distributed data bases will be a transition from replicated to partitioned data bases. In a host/mini tie-in, the data stored at the mini will no longer be a copy of part of the host data base. Instead, each host and mini will maintain a non-redundant segment of the entire distributed data base.

Today, it is difficult to ensure the integrity of a patitioned data base, because damage to — or loss of — any segment may affect the entire distributed data base. Future experience and research by data base technologists will undoubtedly indicate solutions to this problem.

An enormous expansion of demand for end-user facilities will occur during the 1980s. Most distributed data base access today satisfies predefined needs. Future usage will be oriented toward answering unforeseen questions, making a company's valuable data assets play a more timely role in day-to-day operations. The distributed data base software must be expanded accordingly to meet these new requirements.

It is, therefore, possible to envision a gradual progression, through experimentation and learning-by doing, toward the "virtual filing system" which is the goal in the evolution of distributed data base technology.

Booth is a project manager for special projects at Honeywell Information Systems, Phoenix, Ariz.

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Predefined Data Bases Accessible

(Continued from Page S/7)

their own system or an independent network. There may be initial or subscription fees payable to the agency that owns and supports a particular data base.

Practice Makes Perfect

Several drawbacks may exist for the casual on-line searcher. Each vendor uses a different set of commands for access and control with an even greater array of output formats. However, these problems can be overcome with a little practice and study. Each data base has its own little quirks and some degree of training, usually at the users expense, is required to extract the last ounce of efficiency from any one vendor's search, retrieval and command software.

With bibliographical data bases the full text of a reference is not available on the home terminal. It must be obtained from the original source or from a library copy. This is still giant steps ahead of not knowing the reference existed in the first place. At least one vendor is offering a method of ordering full text copies from any one of over 5,000 sources right from the terminal during a search.

Using the most conservative estimates, by the year 1981, there will be over 500,000 on-line searches per month in the U.S. of just bibliographical data bases. With a little vision, the not too distant future of electronic funds transfer and electronic mail could have authors who write for electronic publications that exist only in the memories of computerized retrieval services.

Gregory is president of Gregory Research Associates of Philadelphia, publishers of a loose-leaf directory entitled "Remotely-Accessible Conversational Programs and Data Bases."

Simpler than ABC

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rapidata®

Increase Throughput

Data Base Machines Relieve CPUs of Overhead

By Michael L. O'Connell
Special to CW

As hardware technololgy progressed in the 1960s, we developed very sophisticated computer systems dedicated to our burgeoning communications requirements. The result is today's "front-end" computer, a special-purpose system devoted to collecting, storing and presenting data to the more general-purpose computer connected behind it.

The benefits to be gained from isolating special functions into special machines have been proven, at least in that environment in which the special function is communications. The same principle is now being applied when the special function is data base access. The configuration of such a system is a mirror image of the communications front-end configuration, and the functions performed by both the front end and rear end are identical: collect, store and present data to the general-purpose processor. It might look like the configuration in Figure 1.

Just as a communications machine is used to concentrate messages from multiple terminals for use by a single general-purpose computer, the data base machine collects data from multiple data bases. The data base machine can also service multiple general-purpose machines.

Many Advantages

Advantages of the data base rear-end machine include the following:

- Higher Throughput. The rear-end machine is really a multiprocessor, since it operates in parallel with the general-purpose machine. That means that the sometimes high overhead associated with the many input/output operations required to finally locate the data base record needed by the application program can be overlapped with productive work being done by the general-purpose processor on behalf of other application programs.

In addition, the system software in both the general-purpose processor and the data base machine can be more efficient, since the vendor can specialize each system to the specific task it must perform; i.e., two special-purpose software systems, working together, are more efficient than one general-purpose software system.

- Lower DBMS Maintenance Cost. The DBMS is specialized and isolated in its own machine environment. Therefore, enhancements and maintenance can be accomplished without regard to possible impact of the changes on the general-purpose operating system. Testing of changes is also more efficient, since the possible impact of the changes is much more localized than it would be in a larger general-purpose system.

- Lower General-Purpose Conversion Cost. When the existing general-purpose system is replaced, having the entire data base system in another machine vastly simplifies the job of rolling out the old and rolling in the new. The system software being replaced in the general-purpose system has very little code pertaining to the data base system, so that very little data base code needs to be replaced with the installation of the new system. Of course, the code in the general-purpose system that sends requests to the data base machine and receives responses from it must be replaced.

- Higher Data Integrity. The data base machine is the only machine that has access to the mass storage devices that contain the data base. The interfaces to the data base machine are cleanly defined ones, since they are the external interfaces to the general-purpose machines. Therefore, the chances of polluting the data base through simultaneous, conflicting requests are greatly reduced.

- Greater Security. For much the same reasons that data base integrity is greater, data base security is much better. Unauthorized requests for data base access, whether intentional or not, are much better identified and controlled when the entire machine is devoted to acting as a filter between application programs and the data base.

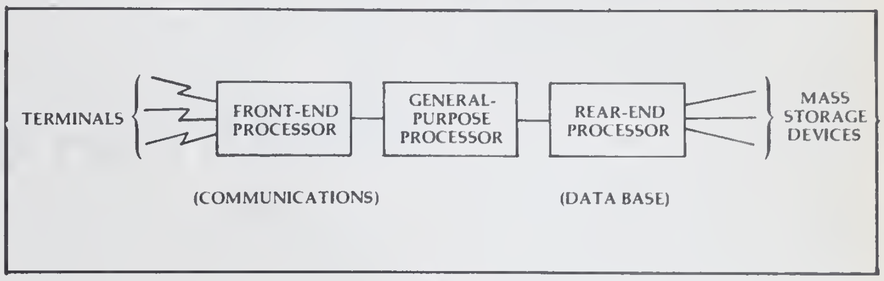

Figure 1.

The interface between the two machines is most easily seen as a high-speed, serial path. To the general-purpose machine, the data base machine appears to be a tape drive or a

(Continued on Page S/20)

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Multiple DBMS Work With Little Redundancy

(Continued from Page S/2)

HP's user manual are for an alumni data file. Since the manual is easy for a novice to use, there was very little training necessary for the initiation of the alumni DBMS, which handles over 2,800 alumni.

The college selection data base of over 2,600 two- and four-year colleges is leased from Time-Share Corp. of Hanover, N.H. Time-Share provides the DBMS (called The Guidance Information System or GIS) for the extensive college file. The firm also provides thorough documentation and on-site training for guidance personnel, who use the file to help students select a school suited to their needs.

The Marist Student Records Accounting System (Marad) was developed in-house over a period of five years. In addition to serving as the DBMS, the 200+ program package handles scheduling, report cards, attendance accounting and a variety of report generations.

Like the Findit and GIS systems, Marad is written in the HP Extended Basic programming language and will run on either HP's F system or the more recent Access system. Though Marad was developed in-house, its development cost was very low, due to the availability of very energetic volunteer student programmers.

For example, Steve Endres, grade 10, single-handedly manages the computer room and James Thomas, now in grade 12, as a ninth grader wrote the permutation generator for the scheduling programs.

Marist would like another 23 M-byte drive to permit more CAI usage in its seven-terminal math lab and expanded applications in library, financial and student programming.

But the school is happy with the multi-DBMS it has now. It would structure the system basically the same way, if starting over today, because the flexibility is worth the small price paid in data redundancy.

Caskey is dean of studies and director of computer applications at Marist School in Atlanta.

DBMS Can Be Off-Loaded

(Continued from Page S/19)

very high-speed terminal attached to the interface.

Each application program request of the data base machine is sent over this path as though it were a tape write operation. Information returned from the data base machine could then be treated by the general-purpose machine as though it were coming from a tape drive or high-speed terminal. The system software necessary in the general-purpose processor is relatively simple, compared with the complexity of the DBMS.

There have been a number of research and development projects undertaken in the past few years to explore back-end data base processors, such as the work done at Bell Labs and by Cullinane Corp. I believe that in the next year or two, when more is understood about the performance and maintainability of such multiprocessor combinations, we'll start to see some very attractive products appear on the commercial market.

Another interesting approach to the problem is to view intelligent disk controllers and channels as true processors and to build them to perform some of the time-consuming tasks involved with searching a data base. A single request from an application program, such as finding a specific record with a given set of values in several data items, can easily result in the necessity of searching hundreds of records.

That evaluation could take place in the mass storage controller, without interrupting the main processor each time another candidate record is retrieved. Tables of pointers which are stored in the data base, and chains of records connected by pointers, could easily and quickly be scanned by an intelligent controller, thus freeing the main processor to do work on behalf of another application program.

All the benefits mentioned earlier can be gained with today's hardware and data base technology, but future use of microprocessors and associative memories will bring even greater gains to the user.

O'Connell is chairman of Codasyl's Data Definition Language Committee and Manager of Product Management and Technical Support at Digital Equipment Corp.

System Analyzes Securities

(Continued from Page S/17)

agency area can instantly analyze the best actions for protecting and improving their position," Hauptmann said.

"For example, BAS enables effective securities swapping by monitoring those that are out of line with other market sectors in price," he said. "It will also pick out profit opportunities among issues with similar maturities or in moving into longer or shorter maturities."

Pictorial displays of yield curves on Treasury notes, which can be presented through BAS, can sometimes reveal pivotal trends that are not easily recognized, Hauptmann added.

In using XDMS for its bond analysis program, First Pennco was able to incorporate existing machine-readable files, as well as meet new data base requirements, with only one data base definition.

All conversation with BAS is in English, using the vernacular of the bond industry. In addition to prompting a beginner through all steps, the system also allows experienced users to "stack" multiple input parameters on one line, suppressing prompt messages and saving processing time. Standardized input eliminates the need to memorize rules for entering data values.

First Pennco plans to expand the capabilities of BAS. "Initially, we have concentrated on the asset side of the balance sheet, but later we will get into more liability considerations," Bench said. Areas being explored include optimum scenarios for deciding types of debt instruments to be employed, effects of interest rate assumptions on yield curves and more accurate evaluations of municipal bond values.

BAS is being offered to other users by First Pennco on a fee basis, plus computer time charges.

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Software 'Layer' Gives Control Over Changes

(Continued from Page S/12)

has four basic parts:

- Generalized Maintenance System (GMS). A single batch job stream handles maintenance of files in the data base. Transaction entries are broken into their component data elements which are then edited, updated to the appropriate data base file, logged and reported out to user offices.
- Generalized Retrieval System (GRS). Again a single batch job stream, it can retrieve data from any part of the data base. It develops output record streams that can be manipulated through sort, merge and match utilities before printing in any desired format.
- Generalized Teleprocessing Support. This is made up of two Cobol programs one of which performs an abbreviated version of the update functions of GMS, while the other performs an abbreviated version of GRS.
- Generalized Utility System. This is a single batch job stream to manipulate files (data sets) and their linkages (relationships) en masse to accommodate new files, new links, expanded files and larger record sizes.

Less than 15 Cobol programs constitute the entire ACS. Simplicity is stressed throughout the system. Tailored programming of application details is typically all the coding needed to bring up a new application system, along with several parameter sets that are entered in what we call Control Data Sets (CDS).

Even the tailored programming is done within a skeletal framework of an existing program and usually requires less than two weeks for the most difficult task.

The programs that make up ACS thus become the fundamental basis for control. Their functions establish the standard for all data base operations in the shop, the core around which all application systems are built. Where data base elements, records or files are concerned, each of the programs seeks its specifications from a CDS, not from its own Data Division.

Program Independence

Since the specification in a CDS is separate from the program, true program independence from the data base is achieved. In our ACS, CDSs are stored in the data base like other data files, but they could be maintained outside that structure.

A crude definition of CDSs could be "files or data sets that contain tables of specialized codes or specifications that can be used by an application program to drive its own operation. While many forms of software involve tables, only application-specific tables like those found in data dictionaries are considered in the DePaul ACS.

The Data Division of a Cobol program doesn't exist in the normal way; rather, we leave space for a table of codes or statements. Such a program is dumb and depends completely on directions received form the CDS tables accessed at execution time. Thus data base "binding" occurs at run times — the acknowledged best point to insure data/program independence.

Additional benefits from the ACS approach include better documenation, single-source entry of application specifications and immediate response when element specifications are changed. Of course, no compiling of programs is required to reflect changing conditions.

Almost any DP operation can benefit from the notion of creating simplified standard job streams, like an ACS, and basic CDSs that are used by these programs. Only four or five logical data sets are required:

- A data element dictionary contains all the system needs to know about an element, leaving extra space for new ideas later.
- Documents that can enter ACS including arrays of elements under a common form or document ID. This can also hold teleprocessing screen formats for I/O display and updating.
- A data set that provides displays of element values extracted by the system: each has a unique display ID which may equate to report number, parameter set number, etc.
- A listing of users, files, data base controls and descriptions pertinent to the environment in which the system resides.

A fifth data set, an extension of the dictionary, contains data values for an element, for purposes of input editing or output translation from a code to an expanded description.

It is significant that no formal data base is really needed to support the suggested CDSs. Effective ACSs have been constructed using Isam, Vsam, Bdam or other non-data base access methods and file organizations.

The ACS functions of data collection, editing, updating, retrieval and reporting must still be programmed to work with CDS in the environment chosen. Whenever a shop develops its own ACS, it typically takes about one man-year or a couple of eager beavers around six months to come up with the basic system.

Use of ACS and CDS can have many benefits; mistakes are easier to correct, time schedules are easier to meet, staff is far more productive, and existing systems can easily interface with GRS record streams.

Harvey is director of computer services at DePaul University. This paper was extracted from a presentation he made at the annual meeting of the Association for Educational Data Systems (Aeds) earlier this year.

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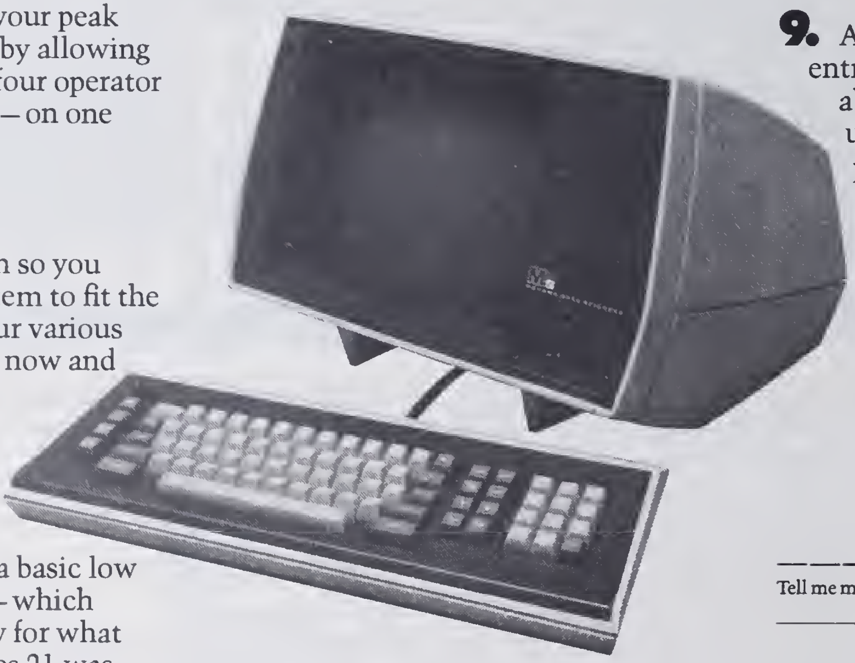

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Rockwell Development Systems Bow

ANAHEIM, Calif. — A floppy-disk-based development system for users of the R6500 microcomputer family and a single-board system for PPS-4/1 microprocessor applications have been introduced by Rockwell International.

The basic configuration of the System 65 floppy-disk system is two built-in disk drives and 16K bytes of static random-access memory (RAM) plus read-only memory (ROM) based resident system software. Since the system monitor, text editor, assembler and symbolic debug programs do not require disk or user memory space, full disk storage and user memory are dedicated to the user's program.

Supports Terminals

System 65 supports a variety of terminals with serial data rates from 110 bit/sec to 9,600 bit/sec and also provides a way of developing and debugging new products, the firm said.

The single-board development system, called the XPO-1, performs the basic functions of assembly and debug in designing PPS-4/1 one chip microcomputers.

It is contained on a 7.5 by 12-in. circuit board on which is mounted a 20-key keyboard, a five-digit LED display that presents the address and data at various locations, a 1K by 8 RAM, additional sockets for a second optional RAM and teletypewriter interfacing circuitry that permits connection to a teleprinter or other terminals.

In addition, by plugging in the selected development circuit and the corresponding assembler microcomputer, the same XPO-1 board can be used for development of all Rockwell's one-chip microcomputers that are members of three PPS-4/1 families.

The System 65 sells for $4,800 and the XPO-1 development system costs $495. Additional information can be obtained from the Rockwell International Electronic Devices Division, 3310 Miraloma Ave., P.O. Box 3669, Anaheim, Calif. 92803.

Micro Bytes

Tektronix Option Lets 8000 Emulate 8085

BEAVERTON, Ore. — Tektronix Inc. has introduced an 8085 option for its 8000 series Microprocessor Labs.

The 8085 package costs $1,850 for the emulator and $850 for the control probe.

Tektronix can be reached at P.O. Box 500, Beaverton, Ore. 97077.

Self-Study Course Offered

SAN DIEGO — Electronic Product Associates, Inc. has published a 90-page self-study course for its Micro-68a training computer.

The lab manual contains 13 chapters, with each chapter making up a complete lesson on topics such as I/O, interrupts and the use of a basic instruction set, according to the vendor.

The lab manual costs $5 from the firm at 1157 Vega St., San Diego, Calif. 92110.

'Micrograbber' Aids Testing

PAMONA, Calif. — The "Micrograbber," from ITT Pamona Electronics is designed for use in testing high-density packaging.

The Model 4233 is 38.86mm (1.53") long and works with a plunger-type action between the thumb and two fingers. It is molded of glass-filled nylon and can withstand temperatures of 240°C (464°F), according to a spokesman. Other features include a stainless steel spring beryllium copper contact and gold plating.

It can be ordered for $1.00 from ITT Pomona Electronics, 1500 E. Ninth St., Pomona, Calif. 91766.

Catalog Describes Multiuser Micro

TEMPE, Ariz. — Microage has announced the availability of an 8-page catalog on the Alpha Micro multiuser time-shared microcomputer system.

The brochure and a newsletter are available from Microage at 803 N. Scottsdale Road, Tempe, Ariz. 85281.

Analog Devices I/O Boards Fit Pro-Log Microcomputers

NORWOOD, Mass. — A 16-channel data acquisition board available in 8- or 12-bit resolution and a 4-channel analog output board that reportedly is functionally, electrically and mechanically compatible with Pro-Log Corp's 4- and 8-bit microcomputers are available from Analog Devices.

The RTI-1220 data acquisition and RTI-1221 analog output boards provide analog signal handling capability for users of Pro-Log or other 8080- or 6800-based microcomputers in process control laboratory or other environements where real-time data is being acquired, processed and used, according to a spokesman.

Up to 16 Channels

The RTI-1220 board accepts up to 16 single-ended or eight differential channels of analog input signals and is protected against input voltages of up to plus or minus 35V (power on) or plus or minus 20V (power off). Available with 8- or 12-bit analog-digital converters, the unit includes a sample-and-hold amplifier that allows the user to sample signal slewing. Four of the input channels have provisions for resistors to allow four 20mA current loops to be sampled, a particularly useful feature for industrial control applications, he said.

The RTI-1221 analog output board provides four channels of 10-bit resolution output for controlling mechanical devices, supplying signals to recorders or other analog functions. It is a complete analog subsystem consisting of double buffered registers; four 10-bit resolution, full 4-quadrant multiplying digital/analog converters; output amplifiers and two precision references for optional on-board or external use, he said.

These units are available from stock and the RTI-1220 8-bit version costs $269 while the 12-bit version costs $330. The RTI-1221 8-bit version costs $235 and the 10-bit version costs $275 from Analog Devices at P.O. Box 280, Route 1 Industrial Park, Norwood, Mass. 02062.

Cassette Transport Has Capstan Drive

OKLAHOMA CITY, Okla. — A fixed-speed electronic cassette tape transport with an (AC) capstan motor is being offered by Triple I, Inc. It features remote control capabilities, fast start/stop, less than 30-sec. rewind and speeds from 1- to 10 in./sec, the firm said.

The Phi-Deck transport, which has four separate motors that control take-up, rewind, play or record, and head engagement, reduces fluctuations to a minimum because the capstan-drive motor has only one job — moving the capstan, a spokesman said.

The unit, which has applications in microprocessors, programming, industrial controls, testing apparatus and other general applications, is priced at $149 from Triple I, Inc., 4605 N. Stiles, P.O. Box 18209, Oklahoma City, Okla. 73118.

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Gigantic Microcomputing Catalog provides information - Microcomputers, books, economical used peripherals, $1.00. COMPUTER WAREHOUSE, Dept. CW, 584 Commonwealth Ave., Boston, MA 02215.

IBM 088-2 Collator. Would make good on line card reader. 650 CPM. $500.00 Y-COMP, Box 9, Windsor, CT. 06095. (203) 688-5206.

Stand-Alone Micro

Board Works With F8 Unit

SAN JOSE, Calif. — A microcomputer board for use with its F8-based systems has been introduced by the Fairchild Camera and Instrument Corp.

Called the OCM/1, the one-card microcomputer can be used as a stand-alone board for low-volume production, for real-time emulation of pilot production and field testing or as a development system using a teletypewriter and/or keyboard display, according to a spokesman.

The OCM/1 consists of four major sections: the processor; a memory section reportedly capable of using four different types of memory; the I/O portion, which consists of a 3850 CPU and a 3851 program storage unit; and the interrupt.

Three Voltages

The board requires three power supply voltages: +12V at 0.255A, +5V at .4A and -5V at 0.09A. The board measures 7.5- by 10.5 in.

The price of the unit is $295. Fairchild is at 1725 Technology Drive, San Jose, Calif. 95110.

Floppy System Fits Cosmac II

SOMERVILLE, N.J. — RCA has introduced a mass memory storage unit designed for use with the Cosmac II development system.

The Floppy Disk System II can assemble a 1000-byte program in 10 minutes compared with approximately one hour for 10 char./sec paper tape systems, a spokesman claimed.

The system includes a dual-disk drive mechanism, interfacing hardware, software for loading programs from the disk into memory, resident editor, assembler and utility programs.

Available in both the domestic and the overseas versions, the system is priced at $3,320 from RCA's Solid-State Division, Box 3200, Somerville, N.J. 08876.

PCM Modules Gives Serial Port Links

SALINE, Mich. — Process Computer Systems, Inc. (PCS) has designed a microcomputer module to interface modems, computer peripherals and other computers to the PCS series of microcomputers.

The Model 1860 board has four asynchronous, trifunctional serial ports that are user-selective with transmission rates from 110- to 9,600 bit/sec.

Up to 32 satellite microcomputer systems can be interfaced to a host microcomputer and they can be located up to 1,000 ft away, according to a spokesman.

The module costs $595 from PCS at 750 N. Maple Road, Saline, Michigan 48176.

MICROCOMPUTING CLASSIFIED EXCHANGE

This special classified section in solid (non-display) format is designed for people who are working with or interested in microcomputing. Through it, you can buy, sell or swap equipment software or services; contact people with similar interests; start clubs; disseminate information; look for game partners; or send messages to other individuals. As the number of ads increases, this section becomes more useful; so we've tried to make ad placement as simple and inexpensive as possible. Details are as follows:

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A

ALU architecture — A microprocessor can constitute the ALU (Arithmetic-Logic Unit) and control portions of a general-purpose computer. However, because of the different objectives of each manufacturer, architectures vary widely. For example, one major system has only two 8-bit programmer-accessible data registers in the CPU, while another processor has an 8-bit accumulator and 64 8-bit data registers. Generally, the ALU handles 8-bit quantities through the accumulator, and the register file is composed of three 16-bit registers. Because the accumulator and ALU are often only 8-bits wide, these three general registers can be accessed by instructions that treat them as six 8-bit registers. The choice of concept is often up to the programmer. From a hardware standpoint, the processor on many systems operates on 8-bit bytes and all I/O operations use an 8-bit data path.

analog computer — A computer which operates on the principle of creating a physical (usually electrical) analogy of a mathematical problem to be solved. Variables such as temperature or flow are represented by the magnitude of a physical phenomenon such as voltage or current. These variables are manipulated by the computer in accordance with mathematical formulas "analoged" on it.

Ansi (American National Standards Institute) — formerly ASA and USASI, an organization that develops and publishes industry standards.

APL language — a programming language developed by Iverson. An unusually extensive set of operators and data structures is used to implement what is considered by many to be the most flexible, powerful and concise algorithmic/procedural language in existence. Primarily used from conversational terminals, its applicability to "production" job processing is limited, but its value for educational and investigative work is great.

application package — A set of computer programs and/or subroutines used to solve problems in a particular application, i.e., business, scientific, financial, etc.

Ascii — A contraction for "American Standard Code for Information Interchange." This standard defines the codes for a character set to be used for information interchange between equipments of different manufacturers.

assembler — The essential capability of an assembler is to translate symbolically represented instructions into their binary equivalents. A well-designed computer is reflected in a versatile, efficient assembly language instruction set. It is a computer program which operates on symbolic input data to produce from such data machine instructions by carrying out such functions as translating symbolic operation codes into computer operating instructions, assigning locations in storage for successive instructions or computing absolute addresses from symbolic notation.

LEARNER'S LEXICON

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The OMEGA 480 Systems are available initially in: Boston, New York City, Philadelphia, Washington, Baltimore and Atlanta; Cleveland, Chicago, Detroit, Milwaukee, Minneapolis, Dallas and Houston; Denver, Portland, Los Angeles and San Francisco. For information phone your local Control Data Representative or write Thomas E. Phillips, Vice President, Peripheral Systems Marketing, Control Data Corp., P.O. Box 0, Minneapolis, MN 55440.

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Reaction to 3031, 3032

Lessors Feel 370s Will Be Competitive

By Molly Upton
CW Staff

The impact on lessors of IBM's 3031 and 3032 announcement is impossible to generalize since it varies according to the type of lease, lessors contacted by *Computerworld* agreed.

Most lessors felt relatively secure since their equipment is out on long-term leases and they had promptly started writing down the cost of the machines after acquiring them.

Many indicated the announcement itself contained no new surprises, and since there are no significant changes in technology, the ball game is being played according to the rules of price/performance, rules under which the lessors feel they can be competitive with their 370s.

In addition, the lower prices for the 148, 158 and 168 that will occur as a result of the new 30 machines are in line with what had been anticipated for 370s which have been on the market from two to five years, they said.

Another factor mentioned by many is that some companies have guaranteed the residual dollars of individual lessors' 370s.

Under this guarantee, the insurers will provide the difference between the original purchase price of the machine and the balance due to any lender when the machine comes off rent, an industry spokesman said.

The policies are pegged to the amount of dollars left unpaid on the loan guaranteed by the insurers, he added, explaining that the market value of the machines is irrelevant as long as the lessor is not forced to liquidate his inventory.

For this guarantee, lessors pay a premium, and in turn agree to be responsible for remarketing of machines, he said.

Lloyds of London recently notified lessors it is not writing any new paper on 370s until it has examined the implications of the new series of announcements and has asked lessors for their views [CW, Oct. 24].

Tom Murphy, president of Itel Leasing, had no comment on the impact of the new machines on Itel's base.

At least two lessors pointed out that the groundrules in the leasing business are changing; that IBM is introducing products at a more rapid pace.

However, they disagreed as to the feasibility of acquiring the newer systems for their portfolios.

A spokesman for Alanthus Corp. observed, "I believe there is a hell of a lot more risk than people see since the groundrules are changing." IBM is introducing machines

(Continued on Page 52)

U.S. Users Spent $38.4 Billion In '76, Afips Study Indicates

By Edith Holmes
CW Staff

WASHINGTON, D.C. — U.S. computer users spent $38.4 billion on DP equipment and services in 1976, the American Federation of Information Processing Societies (Afips) estimated in a report made public here.

These users, who are primarily institutions in business, government and education, expended $20 billion of this total on computer goods and services, $10 billion on salaries and $8.4 billion on overhead, according to the study entitled "Information Processing in the United States: A Quantitative Summary."

While the insurance and banking industries boast the greatest number of firms using computer equipment or services, the manufacturing sector is "by far the largest user in the U.S. in terms of of total expenditures on computer equipment and services," the report stated.

Including 34 figures and tables, the Afips study provides the results of in-depth research into data covering U.S. computer users and suppliers, personnel and education in the information processing field and trends for computing in this country.

Afips drew on the numbers and knowledge of International Data Corp., Auerbach Associates, Inc., the U.S. Department of Labor's Bureau of Labor Statistics, Arthur D. Little, Inc., the U.S. Department of Commerce's Domestic and International Business Administration and its National Bureau of Standards.

Sector Breakdown

The manufacturing sector of the U.S. economy spent 34% of the total monies devoted to computer usage by nongovernment users in 1974. The banking, insurance and other financial industries came in second, accounting for 22% of this total.

In 1975, manufacturing employed 25% of all the general-purpose computer systems installed in the U.S. and 35% of all the

(Continued on Page 53)

At German Show

Users, Exhibitors Think Small

By E. Drake Lundell Jr.
CW Staff

MUNICH — Small business computers designed for stand-alone applications clearly dominated the exhibit floor at Systems 77 here, but distributed data processing was the key phrase in sessions.

Almost 25,000 users attended the show, one of the few European congresses devoted exclusively to data processing.

While technicians debated the "risks and chances" of the distributed concept — and heard the Citibank story — the minds of the buyers in the exhibition halls were clearly on lesser things. The largest mainframe in the five huge halls housing the exhibit was a Univac 90/25 — the smallest Univac machine now available in Germany. And a Univac spokesman said the firm would have brought a smaller system if any were marketed here. However, the firm did show some Varian minicomputers in another booth — Univac having recently acquired that firm.

CW at Systems 77

The small business nature of the show was further marked by the absence of Siemens,

(Continued on Page 61)

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Price Drop Expected

BOSTON — Prices of 370s will continue to decline, according to Sonny Monosson, president of American Used Computer Corp., but he said he could not estimate to what degree.

Deliveries of the IBM 3031 and 3032 will probably start in volume in March, in which case prices of 148s and 158s could drop fairly rapidly, he predicted.

With anticipated early volume deliveries, the situation is unlike that with the 3033, whose unavailability has kept 168-3 prices relatively high, he said.

Monosson commented that the anticipated price drop will be good for used computer dealers, as long as they don't currently have these machines in inventory. A lower price makes a machine more sellable, he indicated.

At a Standstill

Like the lessors, Monosson said business has come almost to a standstill while users evaluate their options.

Monosson suspects the reason IBM did not lower the prices on its 148 as it did the 158 and 168 when it announced the 3033 is that proportionately more of its 148 base is purchased.

With a large purchased base, it faces less exposure to loss of rental income that might come from 148 users who decide to move to 3031s and 3032s, he said.

370s Will Be Competitive With 30 Series: Lessors

(Continued from Page 51)

more often, and the newer units have unprecedented price/performance ratios, which leaves others, such as lessors, with a very weak umbrella, he said.

Although some lessors, such as Thomas McArdle, president of the Computer Lessors Association, termed the new systems "good leasing machines" since they offer relatively low purchase/lease ratios compared with some 370s, the Alanthus spokesman pointed out that historically a low purchase/lease ratio indicates the manufacturer does not expect that machine to have a long life.

It's ironic because if IBM makes a machine that's good for lessors to handle, this generally means IBM plans to sell a lot of them rather than handle them on its own lease and rental plans, he continued.

With a large percentage of an installed base sold, IBM lessens its exposure to revenue erosion that its future product announcements could cause, he said.

Also, he added, when one computes the additional cost factors inherent in the leasing business, such as maintenance and interest, and the necessary discount below IBM's price, the purchase/lease ratio can stretch from three years to six, he indicated.

The 38-month figure, cited by some for a 3031, is "a fallacy that bears no relation to reality," the Alanthus observer said.

Impact Reduced

Many lessors indicated the maturity of the industry has helped the impact of the IBM announcement on the book values of their inventories.

The leasing business is accounting for its 370s differently from the way it did for 360s, and most have the 370s discounted to a small percent so the impact of new, lower priced machines is not as severe as it would have been back in the days of the 360, according to Jerome Naftol, chief operating officer of DPF's computer division. In those days, lessors carried their inventory at relatively high valuations for a longer period of time, he explained.

McArdle agreed, saying more sophisticated thinking went into acquiring 370s than went into 360s.

Naftol said he is still evaluating the IBM announcement.

McArdle indicated he doesn't see any major impact on the book value of the 370/138 and 148.

But the Alanthus spokesman disagreed. Looking to the future, he said there is logically a 20% to 25% cut that should be coming from IBM on the 138 and 148s. The price of a 148 is standing out like a "sore thumb," he continued.

The industry will probably stay away from 138s and 148s on risk leases since there is probably another machine in the wings, such as a 3030, he remarked.

Pat Baker, national sales manager of Comdisco, Inc., indicated there are probably a lot of 148 users who have recently acquired the machine and are rethinking their transaction.

Baker said the announcement has left Comdisco unscathed since it writes primarily straight operating leases over three- and five-year terms. Most of its portfolio is in 145s, 155s and 165s, he added.

Alanthus is not terribly affected by the recent IBM products and price cuts, the spokesman for that firm said, since most of its larger systems are on longer term leases.

The leasing business should come to a standstill for the next six to nine months, he indicated, since 158 and 168 customers are evaluating their options and there are no new machines to offer until delivery begins.

But he predicted 158s should be strong through next year — until quantity deliveries of the new systems start — and then the trouble begins.

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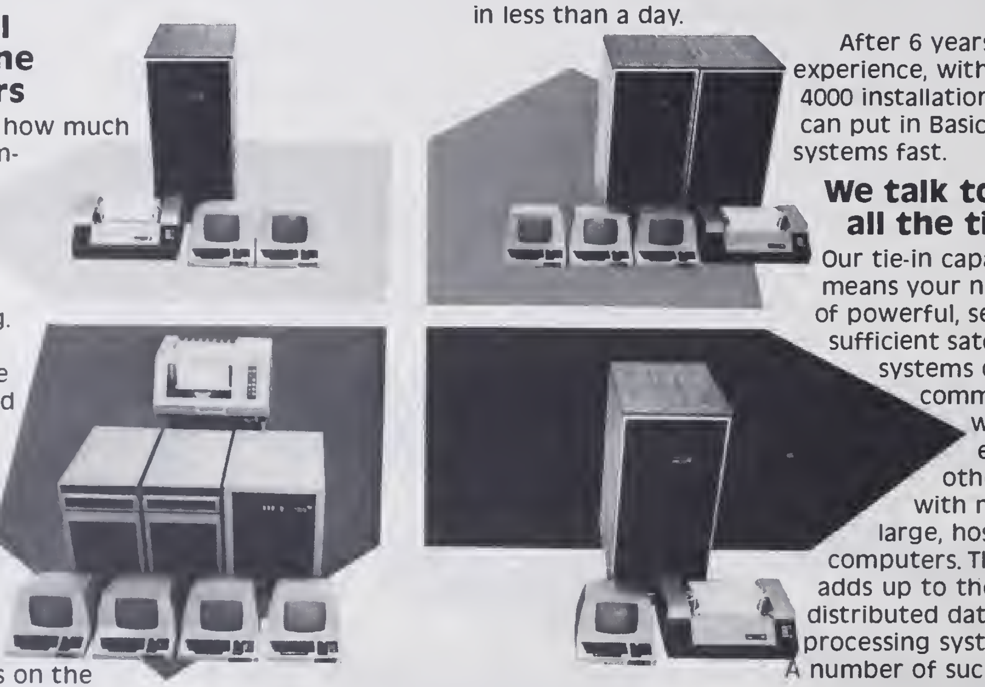

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Basic/Four Systems are also marketed in more than 30 foreign countries.

'76 DP Spending Topped $38 Billion: Afips

(Continued from Page 51)

minicomputers, according to the Afips report.

The Federation of Professinal Computer Societies suggested that manufacturing's dominance in this area is likely to continue since this sector of the economy heavily uses minis and dedicated application computer systems to control both continuous processes and discrete devices. These computer control applications "may be the fastest growing area in the future," Afips said.

While the federal government is the largest single user of computers, accounting for approximately 6% of total usage in the U.S., federal usage is not increasing as fast as that of the U.S. at large, the report said.

The total number of computers owned or leased by the federal government has grown, however — from 5,900 in 1971 to 9,600 in 1976. The Department of Defense accounts for almost half — 45.9% — of federal computer usage, the study said.

The future promises that individual users will soon join the ranks of institutional and big government users, Afips predicted. Developments in microprocessors and digital telecommunications "foretell a future in which 'personal' computing is a widespread reality," the report stated.

Computing on an individual basis may be further facilitated by course offerings designed to increase the degree of 'computer literacy' in the U.S. Beyond courses offered in programs leading to computer-related degrees, "a significant and growing number of computer-related courses" at both the college and high school levels is helping to familiarize the average person with computing, Afips suggested.

The total computer labor force, consisting of such traditional computer-related occupations as programmer, systems analyst, maintenance technician and keypunch operator, numbered 853,000 in the U.S. in 1974, Afips said.

However, this total does not include "a substantial and growing number of individuals whose primary occupation is not in the computer field but who use remote terminals," the report noted. These people — airline reservation or department store clerks and bank tellers, for example — "are now performing functions previously performed by individuals trained in computer-related occupations," Afips concluded.

One indication that the number of such individuals is growing dramatically is that the number of general- and special-purpose terminals in the U.S. was put at 1.2 million in 1976. By 1980, the number of terminals in this country is expected to be 3 million, Afips said.

Of the total 1974 computer labor force of 853,000, 111,000 were employed in the computer manufacturing and service industries and 742,000 were working for institutional computer users.

Looking at the computer labor force from one additional perspective, the National Science Foundation said that "computer specialists" account for 6% of all scientists and engineers in the U.S.

In its research into computer suppliers, Afips found that the computer manufacturing and services industries have grown steadily since 1971. Their estimated revenues have doubled approximately in the five-year period ending 1976 and are forecast to double again in the five-year period ending in 1981.

World revenues for U.S. computer manufacturing firms were $26.6 billion at the end of 1976 and are expected to be $51 billion by the end of 1981. U.S. computer service firm revenues were $5.3 billion at year-end 1976 and are projected to be $13 billion by 1981.

Afips expects the value of shipments of computer equipment to double between now and 1981. Total shipments were valued at $7.8 billion in 1971, $15.9 billion in 1976 and are forecast at $30.5 billion in 1981.

"U.S. firms participate heavily in the world market, deriving approximately 50% of their revenues from overseas sales," the Afips study said, adding that U.S. computer equipment manufacturers dominate the world market, accounting for 87% of the world's computers by value."

Afips warned, however, that the U.S. share of the world market is decreasing as a result of competition from foreign manufacturers. Japan leads this competition, and the U.S. share of the world market is expected to dip to 81% by 1981.

At the same time, the U.S. will continue to enjoy trade surplus in the computer field, the study said.

The report can be obtained for $6.00 from Afips press, 210 Summit Ave., Montvale, N.J. 07645.

Honeywell Buys Incoterm

MINNEAPOLIS — Honeywell, Inc. has agreed to purchase Incoterm Corp. for between $35 million and $44 million. Incoterm will operate as a division, retaining its current top management.

The transaction, slated to occur in early 1978, is subject to approval by a majority of holders of Incoterm A and B class stock voting together and of the preferred stock, as well as to certain other conditions, the firms said.

The agreement calls for Honeywell to convert each Incoterm share, on a common stock equivalent basis, to .42 shares of Honeywell common.

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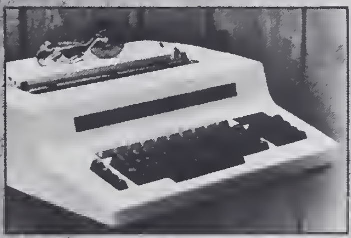
First Agile A1 Sighting Reported

Rejoicing throngs fill streets

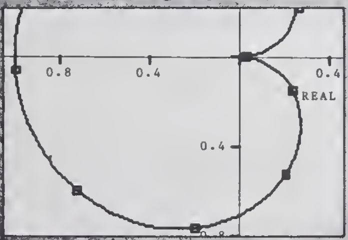


Excitement swept the populace recently as word of the first sighting of the Agile A1 daisy-wheel terminal was flashed throughout the metropolis. The A1, reported to be the first in a long line of microprocessor-based terminals to be offered by Agile, arrived from the firm's large new manufacturing facilities in Sunnyvale, California. A large production run for inventory was said to account for the immediate delivery of the terminal.

Early dispatches reported that every A1 terminal undergoes long burn-in at high temperature to assure purchasers of reliability. Inspection of the unit by your trustworthy reporter (which was hampered by the capering multitudes) disclosed that the A1 features a Selectric-style keyboard with illuminated function lights.

Rumors that the huzzahs of the citizenry caused a horse to bolt on Third Street were found not to be

Fiendishly Clever Plot Revealed



A conspiracy to speed data plotting for science and business has been brought to light with the unveiling of the Agile Plot Support Package. More to follow.

Correspondent reports

26 Agile Service Centers Announced

A network of 26 service centers has been established throughout the Nation to provide care for Agile and GenCom terminals, according to late reports. All centers stock parts for both kinds of terminals, including the **GenCom 300A, 300D,** and **300Q** machines. Centers in the major metropolises are staffed by Agile personnel, while the outlying Territories are served by carefully selected independent companies that are experienced in dealing with the Natives.

In an interview with Mr. R. Bullene, who identified himself as Agile's national service director, your correspondent elicited the following: "It's one thing to have an agreement for national service. It's quite another to have the necessary support in place. We're ready to provide service almost anywhere in the country."

Mr. Bullene solicited direct inquiries via the new electric telephone system at (408) 735-9904.

Variety of lease plans available for Agile A1

Attractive one-year operating leases

Longer-term, high equity plans also offered

(Story on page 6, col. 3)

Exclusive!

Agile Optional Features Revealed

This chronicle has obtained a compendium of the optional features available with the Agile A1 terminal:

◇ Justification mode, which allows the terminal to produce perfect justified text. Variations in the 1/120-inch inter-word and inter-character spacing result in output of nearly photo-composition quality.

◇ A transparency feature allows the printing of all 128 ASCII characters to make debugging and error locating easy.

◇ Data compression allows the user to drive a 55-cps mechanism with a 300-baud line.

◇ The print enhancement option features automatic overstrike and underscore to produce bold, enhanced printing at high speeds.

◇ Hardware options include special keyboard configurations, 45- and 55-cps mechanisms, and custom microcode features.

Details of Agile's options are too voluminous for this brief treatise, but may be had through contact with the manufacturer.

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Agile promises shipment on receipt of order.

(Story on page 2, col. 4)

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Sunnyvale
California 94086
408/735-9904

Agile A1 will appear at the Interface West Show November 1, 2 and 3.

NCR is out to put the world of business on a new computer series called the I-8100.

Low price plus instantaneous entry, reporting and data base updating provide the most cost-efficient man/machine interaction in the industry.

The NCR I-8100 Series is exciting news for those who thought computers were too expensive and complex for their operations. And for those who have or are moving into a distributed processing network.

Everything about the interactive 8100 Series (I-8130 and I-8150) reflects simplicity. It's small, about the size of an office desk. It requires no special environment. It's preprogrammed for easy operation—in fact, any office employee can handle the most sophisticated data processing transaction.

Preprogramming also means your system starts paying off as soon as it's unboxed. Operating instructions appear automatically on the video display terminal to lead your operator through every transaction. Whether the application is budgetary accounting, revenue and expenditure, or payroll,

your organization enjoys the profitable benefits of computer-assisted management from the word go!

Now is the time to learn how a computer series called the I-8100 can focus the power of automation on the big problems of business. Contact the NCR office in your area. Or write to 8100 Marketing Systems, NCR Corporation, Box 606, Dayton 45479.

NCR
Complete Computer Systems

...and still more computer systems to come.

Microdata Agrees To Buy CMC UK

IRVINE, Calif. - Microdata Corp. has agreed to purchase Computer Machiner Corp. (CMC)/UK and is negotiating an agreement with the other CMC/Europe companies under which they will distribute Microdata products, according to Microdata President Donald W. Fuller.

The definite agreement calls for Microdata to purchase 75% of common stock of CMC/UK for about $4 million in cash and notes.

Microdata had originally planned to acquire all of the CMC companies in Europe. CMC/UK had previously been a distributor for CMC products and will be an autonomous subsidiary of Microdata, Fuller said.

CI Notes

Xerox Buys 4.5% Of Threshold

DELRAN, N.J. — Xerox Corp. has purchased into Threshold Technology, Inc., here, picking up 62,500 previously unissued shares of common stock.

The purchase, made at $8 per share, represents an investment of $500,000 by Xerox, which now owns 4.5% of the total number of Threshold shares.

The agreement also granted Xerox an option to buy 62,500 Threshold shares on the same terms in one year. Xerox will have to exercise the option if Threshold achieves a net profit of $275,000 during the current fiscal year and if it meets certain other conditions, according to the agreement.

BR, Diebold Ink Pact

CANTON, Ohio — Bunker Ramo Corp. (BR) and Diebold, Inc. have agreed to jointly market their terminal and communications product lines to the banking industry.

The agreement, reached after eight months of negotiations, allows each firm to continue to market their product lines individually. Under the agreement, however, they can together offer banks control units to handle both the Diebold automated teller machines and cash dispensers as well as BR's point-of-sale and teller terminals.

IBM Building in Tucson

TUSCON, Ariz. — IBM will construct a manufacturing plant and deveopment laboratory near here.

The operation, located on a company-owned site 11 miles out of town, will be run by the General Products Division. Over the next two years, the facility is expected to grow to an employment level of 1,000 and will have 500,000 square feet of space.

The facility will be responsible for magnetic tape drives and library storage devices made by the firm.

TI Gets Big Order

HOUSTON — Texas Instruments, Inc. has received a multimillion-dollar contract from Reynolds & Reynolds for over 2,000 Silent 700 terminals to be used in inventory management and accounting systems for automotive dealerships.

Supershorts

Telenet plans to issue 625,000 shares of common stock at an offering price of $16 to $20 per share. L.F. Rothschild, Unterberg, Towbin of New York will handle this first public offering of Telenet stock.

Four-Phase Systems has placed $20 million worth of senior notes privately.

Pertec Computer Corp. has filed for listing on the New York Stock Exchange. The firm is presently listed on the American Stock Exchange.

The Digitronics Division of Comtec Information Systems, Inc. in Cumberland, R.I., has acquired the manufacturing and marketing rights to the paper tape punch line developed by Precision Mechanisms Corp.

Altel Data, a unit of Alberta Government Telephones in Canada, will market Sycor, Inc.'s terminal equipment throughout the province of Alberta.

Centronics Data Computer Corp. has established a subsidiary in Italy with headquarters in Milan. It is known as Centronics Data Computer (Italia) SpA. The outfit will handle OEM sales and support; end-user marketing will be undertaken by Eurotech Italia SpA.

When something as good as the Teletype model 43 teleprinter comes along, it naturally generates a lot of talk. And for a lot of good reasons.

Delivering true 30-character per second throughput, upper and lower case printing in a 132-column format, the model 43 has an exclusive, Teletype-developed 9-wire matrix impact printhead mechanism. This unique feature provides superior service life as well as exceptional print quality, even on multiple copies.

Under the cover, we kept hardware and moving parts to a minimum for maximum reliability. Solid-state circuitry and only five modular components—plus a built-in test capability—mean service is not only fast, but also simple.

Another convenient cost-saving feature of the model 43 is that it's designed to use 12" wide by 8½" long fanfold paper. Tear off the serrated margins and you've got a 132-character line on the handy 11" x 8½" paper.

When you add up all the model 43's features, you'll think there's been a mistake when you see the low price. But it's true. Because on a price/performance basis, the model 43 is simply unsurpassed.

The Teletype model 43. After all the good things you've heard about it, no wonder nothing even comes close.

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Compare... BASF offers you a 30% saving, lifetime guarantee, free field service, and immediate delivery.

The first name you think of in computers may not be the best choice in data modules. While still completely compatible with existing 3340 drives, BASF data modules cost far less than the drive manufacturer's modules, are guaranteed for as long as you use them, offer free field service, and are available for immediate delivery nationwide.

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Call our nearest regional office: in Bedford, (617) 271-4007; in Los Angeles, (213) 451-8781; in Chicago, (312) 343-6618; in Clifton, N.J., (201) 546-9111; in Dallas, (214) 233-6607; and in Montreal (514) 341-5411.

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Computer Tapes   Disk Packs   Flexydisks   Word Processing Supplies

Terminal response time diagnosis.

If you suspect response time problems, find out for sure. Get the real response time with a TERMINAL RESPONSE TIME MONITOR. This is a hardware monitor that measures the average, minimum, and maximum response time along with the number of transactions. Terminal connection is by optical coupler which eliminates internal probe points. Operation is unattended and automatic. **Price: $950.**

For more information contact: QUESTRONICS, INC.
3596 South 300 West
Salt Lake City, Utah 84115
(801) 262-9923

Wang Introductions Launch Firm Into Supermini Arena

By Esther Surden
CW Staff

NEW YORK – With the introduction of the 2200VS CPU and the WCS/60 and WCS/80 systems by Wang Laboratories, Inc. here recently [CW, Oct. 17], the firm, which previously concentrated on small systems for first-time users, took a step into a market replete with users who have sophisticated processing needs.

The 32-bit virtual memory systems had been under development at Wang for four years, according to Dr. An Wang, president of the company.

What is clear is that Wang sees itself becoming a one-billion-dollar company within the next decade. According to John Cunningham, senior vice-president for sales, achieving that goal will be a matter of course since profits are up 29% from the year 1973 to 1977 and are expected to continue steadily.

"Our hardware product expansion has been both disciplined and ambitious," Cunningham said.

Novices and Experts

The 2200VS-based systems, according to Ned Chang, senior vice-president for marketing, are aimed at the supermini marketplace made up of distributed processing users and first-time users. Distributed processing users have five key requirements, he said. These include the need for systems with incremental growth paths, interactive processing, a large disk storage capacity, industry standard protocols and languages and "broad industry compatibility."

CW Photo by E. Surden

Dr. An Wang

Novice users, on the other hand, need a system that is easy to manage, has industry application software, provides incremental growth, comes from a vendor with established systems support capabilities and is aggressively priced. The WCS/60 and WCS/80 fill these requirements, Chang asserted.

When asked about competition for the system, Chang compared it to the Digital Equipment Corp. PDP-11/70 and the IBM 34. The 34 has less memory available, and a smaller amount of disk storage can be attached, he said.

As for the PDP-11/70, "I don't see that there is any comparison," he said. "It's a more expensive machine that is somewhat faster" than the Wang system but "when price comes into consideration," the Wang will fill more users' needs. Another spokesman said that the system would more accurately compete with the Prime Computer, Inc. 300 system.

"We've made a single sale worth $150,000 right on the exhibit floor. We couldn't be more pleased with the Computer Expo."

Wil Little
Vice President of Marketing
Informer, Inc.

"All of us at Genesis One are very pleased with the quality and quantity of the prospects at the Computer Expo. We gain many additional customers from the new contacts we make at each of the shows."

George W. Saupe, Jr.
Regional Sales Manager
Genesis One Computer Corp.

"We've been to several national shows, but I feel the Computer Expo is the best show we've exhibited in; I like the regional approach. We're looking for leads and we're finding them. There's no question that we'll be back again next year."

J. Patrick McKeon
Regional Sales Manager
Graphic Controls Corporation

"A user who hadn't even considered acquiring our equipment visited our booth and within a week placed an order. This is typical of the success we've had at each of the Computer Expos."

Fred Zirkle
President
Key Tronic

Exhibitor List as of September 1977.

[illegible]

Computer Expo 78 is the nationwide Conference and Exposition program which each year serves the computer community by bringing nine regional Computer Expos to the most important business areas in the U.S.

You'll want to exhibit at one or more of these shows, but for PRIME positioning, you've got to reserve space NOW.

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Executive Corner

• James Simpson has been named vice-president and general manager of Computer Media Group, Memorex Corp.

• Saul B. Dinman has been elected president, treasurer and chief executive officer of GRI Computer Corp.

• Ronald C. Dodson has been appointed vice-president, finance and administration, of Computer Network Corp.

• Gail A. Franke has been promoted to vice-president marketing, of the Computer Network Corp.

• Richard T. May has been appointed vice-president of operations at Computer Network Corp.

• David Martin has been named vice-president and general manager of computer products at National Semiconductor Corp.

• F. Joseph Van Poppelen has been named vice-president of semiconductor marketing at National Semiconductor Corp.

• John Finch has been named vice-president and general manager of semiconductor components at National Semiconductor Corp.

• Phillip A. Rice has been appointed to the post of vice-president of human resources for Basic/Four Corp., an MAI company.

• Valere De Smet has been appointed vice-president of international operations of Decision Data.

• E. Joseph Simmons Jr. has been named vice-president of marketing at Threshold Technology.

• George Kostecki has been named vice-president, midwestern region, of Data Processing Security, Inc. (DPS).

• Ryan P. Schmelz has been elected to the position of vice-president and general counsel to Remote Computing Corp.

• H. Glen Neff has joined Bowne Time Sharing, Inc. as vice-president of marketing.

• James S. Campbell has been appointed president of Xerox Corp.'s Business Systems operating unit in El Segundo, Calif.

• Albert M. Kritz has been appointed to the post of vice-president, engineering, at Computer Transceiver Systems, Inc. (OTC).

• W.H.J. Selders has joined TEC, Inc. as vice-president, finance, and chief financial officer.

• Gary R. Alexander has been named a vice-president by logical Design Corp.

• George Roberts has been named vice-president and general manager of computer products at National Semiconductor Corp.

• Kurt W. Hackel has been named general manager of NCR Germany and Lucien Bardane has been appointed general manager of NCR France.

• Anthony L. Fazio has been named to the new position of vice-president of sales for Sycor, Inc.

• David Westermann was appointed chairman of the board and Sal J. Nuzzo was named president of the Hazeltine Corp.

• Lou Burns has been appointed director of marketing support for Quantor Corp.

• Kenneth R. Bilodeau has been promoted to director of finance and planning by California Microwave, Inc.

• John W. Hemmer has joined the Data Dimensions, Inc. board of directors.

• Frank R. Lautenberg has been elected chairman of the board and chief executive officer of Automatic Data Processing, Inc. Henry Taub assumes the post of chairman of the newly established executive committee while Josh Weston has been elected president and chief operating officer.

• John C. Lobb has been elected chairman of the executive committee of the board of directors of Modular Computer Systems, Inc.

• Thomas R. Taylor has been promoted to vice-president in charge of product marketing at Storage Technology Corp.

• Dharam V. Ahuja has been named director of product marketing of the large systems operation of National Semiconductor's Computer Products Group.

Orders & Installations

Texarkana National Bank has ordered a Financial Control System from University Computing Co. (UCC). This system will be used in its general ledger applications.

Griffin Computer Services, a wholly owned subsidiary of Security New York State Corp. of Rochester, N.Y., will install this fall a Honeywell Page Printing System (PPS) valued at $178,000.

The City of Seattle has installed a Univac 90/80 system valued at $3 million.

Sargent & Lundy, Chicago, has ordered a Univac 1100/81 system.

The Chase Manhattan Bank has ordered a Watsbox telephone management system from Action Communication Systems, Inc.

Jewel Food Stores of Chicago has ordered Datachecker electronic point-of-sale checkout systems from National Semiconductor Corp. valued at $3.5 million.

Raybestos-Manhattan, Inc. of Blue Bell, Pa., has ordered a Univac 1100/22 system, valued at about $3 million for its corporate headquarters in Trumbull, Conn.

Hospital Data Center of Virginia, a shared hospital computer center headquartered in Norfolk, Va., has installed a Honeywell Model 66/10 computer system and a high-speed Page Printing System valued at $1.7 million.

Lake-to-Lake Dairy Cooperative of Sheboygan, Wis., has ordered an XL40 distributed keyprocessing system from CMC, a division of Pertec Computer Corp.

Quality Farm & Fleet of Muskegon, Mich. has installed a Honeywell Model 66/10 computer system valued at $1.3 million.

The Atlantic Richfield Co. (Arco) has ordered three Trace systems, valued at about $2.9 million, to be used for processing credit card invoices from Recognition Equipment, Inc. (REI).

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We seek to acquire computer software for specific applications in such areas as:

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Qualifying packages should run on:

DEC • Datapoint • Data General • Basic/Four
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These packages need **not** be of particular size, language function or use. Let the marketing people handle that. We simply require that it work! . . . and that it be adequately documented and necessary operating instructions be provided.

But here's the best part–your sale to us doesn't prohibit your selling your package to others. We'll pay you for the source code and there are no restrictions. We'll simply be friendly competitors.

Please call Jackie Lawson for more information or send us some information about your product.

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The fastest way to plug into OS.

The **OS/VS RPG II compiler** bridges the gap between small and large computer systems. The **RPG II compiler** is a software system that allows computer programs designed for small systems to be run on large systems. Providing lowest cost...fastest way to OS.

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Earnings Reports

CARTERFONE COMMUNICATIONS
Three Months Ended June 30

	1977	a1976
Shr Ernd	$.08	$.06
Revenue	2,627,500	2,403,800
Earnings	160,900	120,400
9 Mo Shr	.14	.30
Revenue	7,765,000	6,903,700
Earnings	285,900	638,400

a-Restated

COMPUTER NETWORK
Three Months Ended June 30

	1977	1976
Shr Ernd	$.26	$.14
Revenue	3,377,000	1,498,000
Earnings	319,000	184,000

COMPUSCAN
Year Ended May 31

	1977	1976
Shr Ernd	$.55	$.91
Revenue	13,708,000	13,090,000
Tax Cred	.....	227,000
Earnings	1,223,000	1,627,000

ANACOMP
Year Ended June 30

	1977	1976
Shr Ernd	$1.09	a$.70
Revenue	16,183,279	12,850,946
Earnings	1,192,238	835,395
3 Mo Shr	.29	a.24
Revenue	5,239,886	3,463,004
Earnings	319,642	266,618

a-Adjusted to reflect 10% stock dividend paid Sept. 1, 1977 on holders of record Aug. 11.

THRESHOLD TECHNOLOGY
Year Ended June 30

	1977	a1976
Revenue	$1,275,404	...
Loss	524,804	...

a-Compareble figures unavailable; company changed end of fiscal year from July 31 to June 30.

MEDICAL COMPUTER SYSTEMS
Three Months Ended June 30

	1977	1976
Shr Ernd	$.12	$.10
Revenue	2,577,083	2,277,474
Earnings	323,638	266,341
6 Mo Shr	.23	.19
Revenue	5,116,699	4,467,673
Earnings	633,425	510,976

METRIDATA COMPUTING
Three Months Ended June 30

	1977	1976
Shr Ernd	$.33	$.21
Revenue	2,707,000	2,490,000
Earnings	115,000	86,000
6 Mo Shr	.69	.55
Revenue	5,573,000	5,067,000
Earnings	258,000	218,000

SYSTEMS ENGINEERING LABS
Year Ended June 24

	1977	1978
Shr Ernd	$.55	.....
Revenue	30,774,000	$20,003,000
Earnings	1,549,000	(7,000)
3 Mo Shr	.23	.19
Revenue	9,012,000	6,317,000
Revenue	9,012,000	6,317,000
Earnings	662,000	483,000

TECHNALYSIS
Three Months Ended June 30

	1977	1976
Shr Ernd	$.16	$.06
Revenue	804,520	539,373
Earnings	89,757	32,990
6 Mo Shr	.28	.11
Revenue	1,495,107	1,017,104
Eernings	155,02	61,726

MSI DATA
Three Months Ended June 25

	1977	1976
Shr Ernd	$.40	$.32
Revenue	9,057,739	8,643,178
Earnings	798,214	626,344

COMPUTER TASK GROUP
Six Months Ended June 30

	1977	1976
Revenue	$4,185,000	$2,427,000
Earnings	160,067	70,362

COMSERV
Six Months Ended June 30

	1977	e1976
Shr Ernd	$.14	$(.04)
Revenue	1,466,815	994,250
Eernings	113,277	(36,191)

DPF
Year Ended Mey 31

	1977	e1976
Shr Ernd	....	$.51
Revenue	$464,986,000	22,600,000
Eernings	5,831,000	2,234,000
3 Mo Shr	.....	.09
Revenue	113,120,000	5,394,000
Earnings	2,764,000	435,000

e-Resteted

HARRIS
Year Ended June 30

	1977	1976
eShr Ernd	$3.12	$2.13
Revenue	646,268,000	513,883,000
Earnings	40,059,000	26,838,000
e3 Mo Shr	.98	.59
Revenue	198,810,000	139,266,000
Eernings	12,487,000	7,485,000

e-Adjusted for 2-for-1 stock split declered in November 1976.

LOGICON
Three Months Ended June 30

	1977	1976
Shr Ernd	$.30	$.26
Revenue	6,879,000	6,781,000
Earnings	271,000	223,000

COMPUTER CONSOLES
Six Months Ended June 30

	1977	1976
Shr Ernd	$.17	$.17
Revenue	8,050,845	4,731,293
Tax Cred	91,500	.....
Earnings	288,036	293,200

COMPUTER INVESTORS GROUP
Three Months Ended-June 30

	1977	1976
Shr Ernd	.....	$.11
Revenue	$6,786,000	7,013,000
Earnings	(676,000)	249,000

MATHEMATICA
Year Ended June 30

	1977	1976
Shr Ernd	$.98	$.96
Revenue	22,670,000	18,870,00
Earnings	686,000	670,000
3 Mo Shr	.22	.32
Revenue	6,182,000	5,821,000
Earnings	156,000	223,000

PERTEC COMPUTER
Three Months Ended June 24

	1977	1976
Shr Ernd	$.24	$.16
Revenue	29,046,000	22,734,000
Eernings	1,471,000	951,000

RELIANCE GROUP
Three Months Ended June 30

	1977	1976
Shr Ernd	$2.77	$1.39
Revenue	279,033,000	236,155,000
Earnings	22,961,000	12,006,000
6 Mo Shr	5.06	.92
Revenue	543,520,000	456,095,000
Earnings	42,118,000	10,316,000

SCAN-DATA
Three Months Ended June 30

	1977	1976
Shr Ernd	$(.06)	$.09
Revenue	3,137,001	4,378,908
Earnings	(100,553)	167,906
6 Mo Shr	.13	.10
Revenue	7,419,641	7,666,316
Earnings	223,318	184,434

SCIENTIFIC SOFTWARE
Six Months Ended June 30

	1977	1976
Shr Ernd	$.12	$.23
Revenue	3,364,747	3,195,671
Earnings	146,913	301,187

STERLING COMPUTER SYSTEMS
Three Months Ended June 30

	1977	1978
Shr Ernd	$.04	$.04
Revenue	526,572	543,961
Earnings	25,175	29,697

SYNCOM
Three Months Ended June 30

	1977	e1976
Shr Ernd	$.022	$(.012)
Revenue	1,116,800	868,562
Disc Op	36,275	.....
Earnings	39,774	(20,904)

a-Restated to reflect sale of Business Systems Group.

Take an in-depth look at in-house timesharing:

You know the problems facing the data processing department:

Other departments in your company want faster response, broader capabilities, better service.

And your management wants you to hold down your operating costs.

You're probably looking hard for a solution. A closer look at in-house timesharing could give it to you.

Fast, long-lasting relief

Unlike upgrading a large central computer, expansion to an in-house timesharing system isn't a time-and-money-consuming ordeal.

And unlike buying outside computer time, you're not building in a monthly bill that inevitably keeps building up.

Adding an in-house timesharing capability is a shrewd way to add computer power. Because it won't add significantly to your operating costs; in fact, it can pay for itself by reducing current costs.

Especially if you add the system specifically built for timesharing: our BTI 4000.

A timesharer's timesharer

The BTI 4000 Interactive Timesharing System is made by us:

Basic Timesharing, Inc. We're the computer manufacturer with timeshare experience. Which has helped us produce a computer uniquely right for timesharing.

To help you do more—while helping your company spend less.

Easy to begin, room to grow

You can own your own BTI 4000 for as little as $35,950. For that you get a ready-to-go system with 10 megabytes of storage and 8 ports—just add terminals.

And start-up won't cause a departmental hang-up. The BTI 4000 can be installed and working for you in one working day.

Expanding to do even more work takes even less work. The BTI 4000 features modular construction, so system downtime for expansion is minutes, rather than days. You can add disk storage to 400 megabytes; increase user capacity to 32 ports; add peripherals like industry-compatible magnetic tape and a line printer.

Hard working, always working

The BTI 4000 is a true timesharing system. It allows doing any mix of tasks, all at the same time, all completely independent.

It also gives you continuous system availability, because software housekeeping can be performed while users are on-line.

There's also off-hours job-stream processing. So the BTI 4000 can be working for you, even when no one's around.

The BTI 4000 uses BASIC-X, an unusually powerful extension of the BASIC user language, enhanced for business programming.

What's more, the BTI 4000 offers heirarchal account organization and stringent security so that you can maintain total control over who's using it, and what they can do.

And it does all this without a full-time operator.

Inexpensive help

Used during typical office hours, the operating costs for a BTI 4000, including maintenance, are about $1 per terminal hour. And should you grow to 24 hour usage, your operating costs shrink to less than 10¢ per terminal hour.

Around-the-clock help

We back our BTI 4000 with any-hour, anywhere, on-line support with dial-up access for problem diagnosis. Yet in a typical installation, our maintenance plan costs less than 1% of the system's purchase price per month.

Look to us

The BTI 4000. The interactive timesharing system that will help your data processing department do more, for less.

For more information, just look to the Basic Timesharing office nearest you.

The BTI 4000 Means Business.

Basic Timesharing Inc., 870 W. Maude Ave., Sunnyvale, CA 94086. Sales Offices: East: Cherry Hill, NJ (609) 662-1122; Midwest: Minneapolis, MN (612) 854-1122, Chicago, IL (312) 298-1177; South: Dallas, TX (214) 630-2431; West: Sunnyvale, CA (408) 733-1122, Anaheim, CA (714) 533-7161

Small Systems Make Debut

NEW YORK — At least two exhibitors at the recent Information Management Conference and Exposition here showed their compact versions of small business systems, each of which look like a CRT terminal.

With the "Look Ma, no box" approach, Qantel Corp. placed in a futuristic-looking CRT all the innards necessary to give the user a small business system — including those parts commonly placed in a box underneath the desk.

The System 210 contains up to 65K of memory, using 16K chips, and is software-compatible with the rest of the firm's product line; it also features asnchronous communications facilities, a spokesman said.

Hewlett-Packard Co. showed its "Friendly business computer," the System 25, which has a host of function keys arrayed on the keyboard, and looks rather like one of HP's more complex calculators. Again, however, everything sits on top of the desk.

Although one speaker indicated distributed data processing is a concept, not a product, Basic/Four Inc. thought otherwise when it gave its systems the capability to interconnect with larger CPUs via asynchronous communication.

Microdata, Inc. unveiled its upgrade to the Reality system, dubbed the Royale, (see Page 42), and its OEM cohort, the Express system.

For OEMs, Digi-Log Systems, Inc. showed its Microterm II, which it termed an "integrated desktop powerhouse." The unit has a CRT, two minifloppy drives and an integral printer; it can contain up to 80K of random-access memory.

Qantel System 210

The unit is driven by a Zilog Z80 microprocessor. A second Z80 handles communications, the printer, keyboard, CRT and data manipulation functions, the firm said.

The Microterm II costs $7,000 in single quantities and $6,000 in lots of 100, the firm said from Babylon Road, Horsham, Pa. 19044.

Europeans Told To Think Small

(Continued from Page 51)

the only major mainframer not represented. Sources indicated that it did not come only because it does not have a product in the smaller business area.

Many of the names of the almost 470 exhibitors would be familiar to the American audience, led by the likes of IBM, Honeywell and NCR. But all emphasized the lower end of their lines.

IBM only exhibited a System 34 and Series/1 minicomputer — and baldly refused to answer any questions about its larger systems or at least its new 3031 and 3032 processors. While those units received some interest, IBM in Germany has not even announced prices for them at present.

Among less familiar firms, from the American point of view, small systems also dominated.

While most of the companies exhibiting came from Germany — or were German subsidiaries of American firms — the show presented an international flavor with a large block of booths taken by the U.S. consulate here where 68 American firms showed their wares as a group.

With some exceptions, the U.S. contingent offered components, with just a smattering of complete systems and software firms.

The British were also out in force with a block of 20 companies.

Poland, Hungary, Belgium, Canada, Italy, France, Luxembourg, The Netherlands and Switzerland were also represented.

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- Selecting the right terminal for the right job in the right network.
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If you're involved with data communications, or if you expect to be in the not too distant future, our November 28th special report will help you have what you need to know. And if you market data communications equipment or services, our report is where you should advertise. Ad closing date is November 11. For details, contact your *Computerworld* salesman. Or call Terry Williams at (617) 965-5800 to reserve space for your ad.

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Computer-Link Has Product, Looks for Niche

By Edith Holmes
CW Staff

BURLINGTON, Mass.— Eugene P. Brandeis is looking for a DP industry market niche that is in need of a product with some technical content, that is specialized to a certain degree and that won't be attractive to every other firm in the business.

Brandeis is also president of Computer-Link here.

A little luck and several orders over the next few months for a device Computer-Link recently introduced will prove whether his search is at a temporary end.

The product: a one-step remittance processor, complete with its own user-programmable microcomputer, designed to help businesses cut their bill payment processing costs by between 80% and 90% [CW, Aug. 29].

Computer-Link isn't the first company to discover the market potential for remittance processing — the handling of payment checks and stubs. There are six other manufacturers with products in this area, "unfortunately including IBM and Burroughs," according to Brandeis.

But every machine on the market in this field is different, he contended.

What makes Computer-Link's Sorc/800 different is that it doesn't require a central CPU. It has a built-in Digital Equipment Corp. LSI-11 microcomputer with 32K words of memory.

The price tag on the Sorc/800 is anywhere from $32,000 to $37,000 depending on the type of scanning required. Computer-Link's competitors sell remittance processors for between $26,000 and $27,000, but the user has to buy a $60,000 CPU to go with it, Brandeis maintained.

Brandeis concludes that Computer-Link can more economically service the smaller user — an insurance agency — a small department store, a large stationer — anyone who must process at least 2,000 payments each day — with its remittance processor.

Departure From Tradition

Eight years old and 70 employees strong, Computer-Link is known in the industry for its media maintenance products — cleaning and testing devices for tapes and disks, line counters and reinking machines. The remittance processor thus represents a significant departure from the firm's traditional product line.

"There is no one brilliant technical innovation embodied in Computer-Link's machine," Brandeis said. Sorc/800 "is a systems and procedures solution to a nightmarish problem."

The problem is how to get money received in payment for goods and services to the bank and credited to an account quickly — belongs chiefly to the company receiving the payment check and stub. It can also affect the very end-user — the consumer — who, for example, mails in his check to pay the telephone company but forgets to include the punch card that identifies who he is and what phone bill he is paying.

Accomplished manually, remittance processing takes a lot of time and several clerks; it rarely permits quick crediting of the money to the company's bank account, Brandeis noted.

In the Computer-Link device, a conveyor belt essentially pulls the checks and stubs along, and the machine automatically inspects and compares the amounts, inscribes an audit trail, endorses and separately batches both bills and checks and finally produces payment records and deposit slips for transfer of the funds to the bank.

The operator only has to handle the check and stub once, Brandeis stated.

The microcomputer permits the remittance processor to deal simultaneously with single or intermixed account numbers. The device can be programmed for each billing department's operations, he noted.

Different Machine

Brandeis believes his firm's machine is different because it handles punch cards and optical documents. Even if the stub document is mutilated, the payment can be processed as long as the account number can be read.

In addition, the machine's memory permits an automatic lookup of those account numbers that are invalid for some reason. The memory also allows alphanumeric communications with the operator, avoiding the use of codes, Brandeis said.

The alpha character capability made possible by a sizable memory lets the company write a detailed audit trail on the back of the check, thus making the whole transaction less mysterious to the consumer, he added.

The "bottom line" for any remittance processor is the ability to encode the check with its amount for direct deposit at the bank. "If the machine doesn't do that, it's not doing remittance processing," Brandeis maintained.

By encoding the check, a company gets that payment into "the back door of the bank."

What About EFT?

But what about electronic funds transfer (EFT)? Won't it take a chunk out of the market Computer-Link envisions for itself?

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Rank as importer from US *Third*

Computer Management is a monthly magazine recently purchased by *Computerworld, Inc.* Monthly circulation is 30,000.

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Computerwoche is a weekly tabloid newspaper started by *Computerworld, Inc.* It has a circulation of 21,000 to the West German computer community

SHUKAN COMPUTER
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World rank as DP market. *Second*
1975 DP expenditures: *$4.6 Billion*
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DATANEWS
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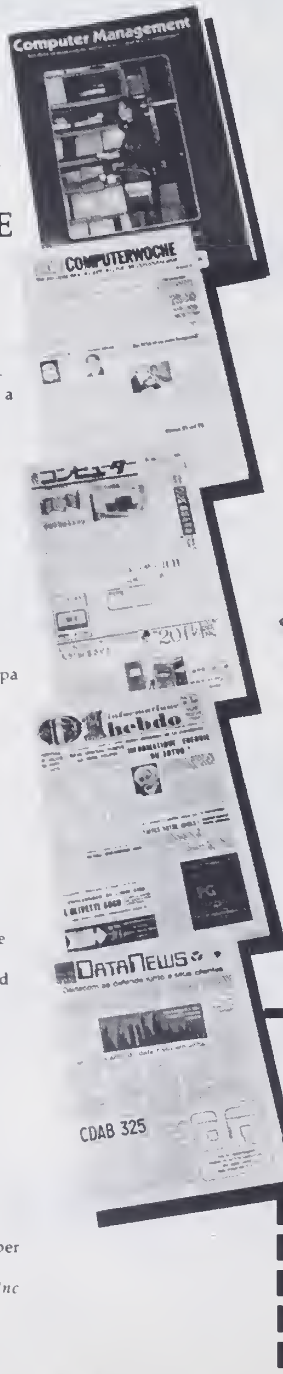
World rank as DP market. *12th*
1975 DP expenditures *$250 Million*
1975 imports from US *$60 Million*
Rank as importer from US *(Est) 10th*

DataNews is a bi-weekly tabloid newspaper in Portuguese with an English-language summary. It is owned by *Computerworld, Inc* and has a circulation of 7,000.



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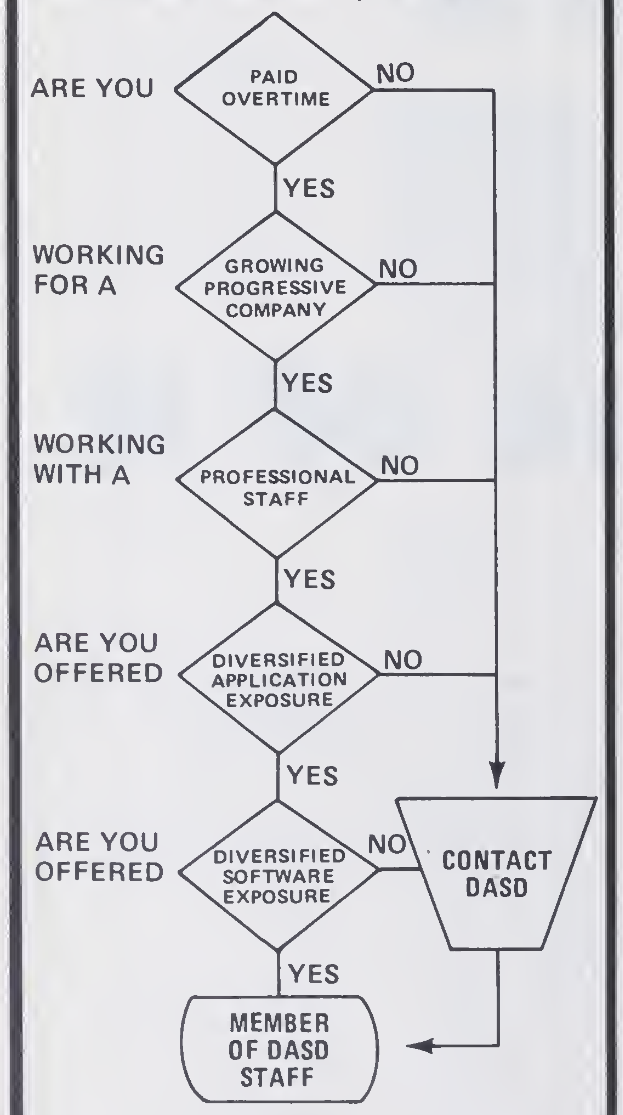

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Technical degree or equivalent plus one or more years experience for support of CONTROL DATA CORPORATION's worldwide CYBERNET Time-Sharing Network. Potential candidates must have at least two of the following languages: COBOL, FORTRAN, APL, BASIC or ASSEMBLY LANGUAGE. Desire CDC 6000 CYBER 70 series experience, but will consider other large scale third generation computers. Candidates must have good oral communication, enjoy troubleshooting customer's problems & have ability to interface with customers.

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CONTROL DATA CORPORATION, Manufacturer of some of the world's most powerful & fastest computers, has immediate requirements for systems programmers with large scale computer systems experience with preference for CDC 6600/7600 CYBER Series for overall language; Software support at CYBERNET, our worldwide interactive/remote Batch Time-sharing and computer service network. The successful candidate should have at least three years experience in systems or application programming and be interested in software and user support. College degree preferred.

CONTROL DATA offers excellent benefits, flexible hours, vacation/sick leave; health/life insurance; family dental plan; retirement plan and tuition aid. Send resume to:

Wesley Johnson, Jr.
PHONE: (301) 468-8102
CONTROL DATA CORPORATION,
6003 Executive Boulevard, Rockville, Maryland 20852.

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- Participant in the development of on-line manufacturing systems
- Ability to prepare system design and detail program specification
- Technical proficiency including a working knowledge of Cobol and exposure to assembler. Knowledge of communications systems and data base management a plus.

Programmer Analysts

- Some Design experience preferably in manufacturing systems
- Technical proficiency including a working knowledge of Cobol and exposure to assembler
- Self sufficient debugging skills

OPENINGS EXIST IN THE FOLLOWING LOCATIONS
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Westboro, MA, Westbrook, ME,
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DataGeneral

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DATA PROCESSING OPPORTUNITIES IN IRAN

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Advanced degree in computer science or allied field, minimum 15 years experience, for Assistant General Manager, 8 years, for the others, 5 years in management, extensive experience in MIS design, implementation and operation of large-scale systems.

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PhD in OR, 15 years experience, including 5 in management, including applied OR techniques and data base concept and design.

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PhD in computer science or allied field, 15 years in computer technology, including 8 in management of training, plus knowledge of data base data communication systems

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NATIONAL IRANIAN OIL COMPANY
1271 Avenue of the Americas
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Data Processing

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- Programmer Analysts
- Systems Analysts

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Personnel
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Equal Opportunity Employer

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Successful experience in the design, development, implementation and management of one or more of the following large scale data processing systems. Payroll and personnel, employee information, customer information, materials management, and construction management systems.

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B.S. degree in accounting, C.P.A. preferred with experience in the design of plant and property accounting systems for the utilities industries.

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Experience in the implementation of on-line CICS customer information systems.

CONSULTANT

B.S. degree in accounting, CPA preferred. Experience in the design of accounts payable systems.

DATA BASE SPECIALIST

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CONSULTANT

B.S. degree in engineering preferred with proven experience in the design of computerized power distribution systems for the electric utilities.

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4255 LBJ, Suite 220
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Desired Experience

- Systems
  - I/O Drivers
  - Diagnostics
  - Operating Systems
- Applications
  - Vocationally oriented to the Retail Market
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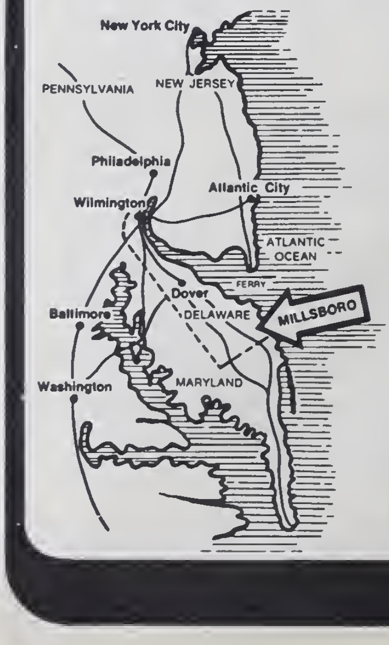
- 1-3 years experience in Assembly language with mini or microcomputers
- 8080 experience a plus
- BS in CS, EE or Math



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Terminal Systems Division
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Millsboro. DE 19966

NCR

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Our Research and Development Group is seeking a Systems Programmer who wants the challenge of involvement with communications network production development. The successful applicant should have 5 years' experience programming IBM systems, and a working knowledge of telecommunications acccss methods (BTAM, VTAM), operating systems (TSO, CICS . . .) and protocols (BSC, HASP, 3270, SDLC). BS/MS in Computer Science or equivalent is essential.

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The individual should be experienced in all phases of computer systems, including development and overall operations, with 3 to 5 years in the computer audit area.

Salary commensurate with experience, including complete benefit package. Send complete resume and salary requirements to:

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He will be required to manage the Unit which will provide hardware and software support to technical experts developing and applying advanced planning and research techniques.

He will, of course, also be responsible for planning and supervising the future growth and development of the Unit including user training

The successful candidate will have academic qualifications that are both sound and relevant and should have a good command of English He will have at least eight years' experience in computing Ideally, this would have been in a research or scientific environment.

A distinct advantage would be oil industry experience, particularly if energy modelling systems were involved He should already have first-hand experience of the management of large technical computing installations Relevant experience would include large-scale scientific planning applications, and familiarity with current major programming languages

The post is permanent The attraction of working in an international agency environment and the combined package of tax-free salary, associated benefits and pension rights will attract a man of the appropriate calibre

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Miami, Florida 33169

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Minneapolis, Minnesota 55402

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428 Forbes Avenue
Pittsburgh, Pennsylvania 15219

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South Orange, N J 07079

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Data Processing

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Professional Recruiting
Department K

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To meet the requirements for these positions, the qualified candidates will have a minimum of 10 years solid experience in a manufacturing environment. The Systems Candidate will have in-depth experience in designing, implementing and project management of complex systems. The Equipment Candidate will have extensive experience in evaluating and installing various computers and telecommunications equipment.

Candidates must have exceptional analytical ability, sound business judgment, success in working with operating management, a desire for high visibility and to be measured by performance.

We offer outstanding benefits and a very competitive salary commensurate with experience.

Please send your resume and salary history to:

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Gerber Products Company

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PROGRAMMER ANALYSTS

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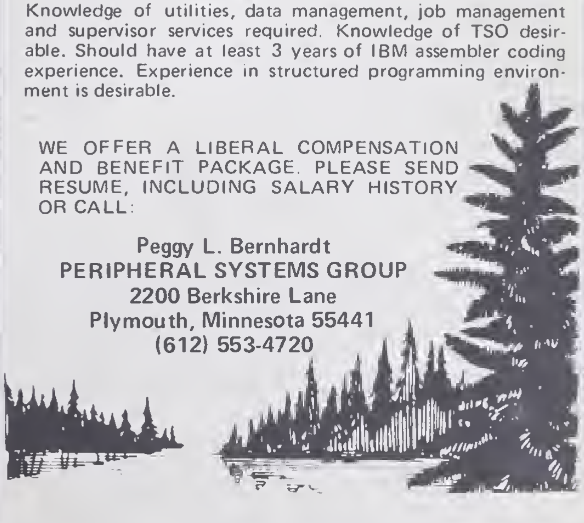

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Storage Technology Corporation offers an ideal location, excellent salary and benefits program, including health and dental insurance, stock purchase, retirement plan and liberal relocation. Send resumes and salary history in complete confidence to Linda Henry:

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The work of the department is interdisciplinary, and its scope ranges over the whole life cycle of computer-based information systems. Areas where additional strength is requied - teaching and opening up new areas of research - include management information systems, organizational theory, gneral systems theory, the design of information systems for major application areas (e.g., medical information systems), and the management of the systems development and operation process. Send resume including references to:

Edgar H. Sibley
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University of Maryland
College Park, MD 20742

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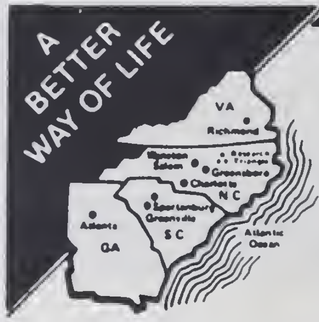

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. . . or write indicating travel and relocation restrictions, salary and position of interest to Mr. Dransfield at:

SYSTEMS & COMPUTER TECHNOLOGY CORPORATION
Seven North Five Point Road
West Chester, Pennsylvania 19380
(215) 692-7990)

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Large Midwestern Corporation has openings for qualified applicants with experience as Systems Programmers in the following areas:

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UNIVAC Software
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Applicants should have a degree in applied math, engineering, computer science or equivalent work experience; be willing to attend expense paid vendor education courses designed to fulfill deficiencies in work experience; and demonstrate proficiency in assembler language.

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COMPUTER ANALYSTS

The State University of New York at Binghamton is accepting applications for 2 positions in Administrative Data Processing Systems. The positions require a demonstrated proficiency in COBOL. The Computer Center utilizes an IBM 370-158 operating under OS/VS-1.

SENIOR PROGRAMMER/ANALYST

This position requires a minimum of three years experience in applications development involving the areas of systems analysis, design, programming and documentation. The individual in this position must possess strong analytic and communicative skills. Experience in applications development in a university environment is highly desirable.

PROGRAMMER/ANALYST

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Salary for the positions are in the $14,000 - $16,800 range. In addition, SUNY offers an outstanding employee benefits package.

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Send resume and salary history by November 15th, 1977 to:

Mr. Scott Hill
Assistant Director
Administrative Systems
Computer Center
SUNY-Binghamton
Binghamton, NY 13901

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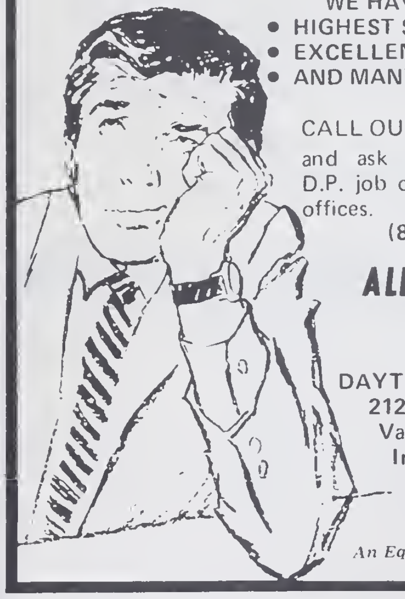

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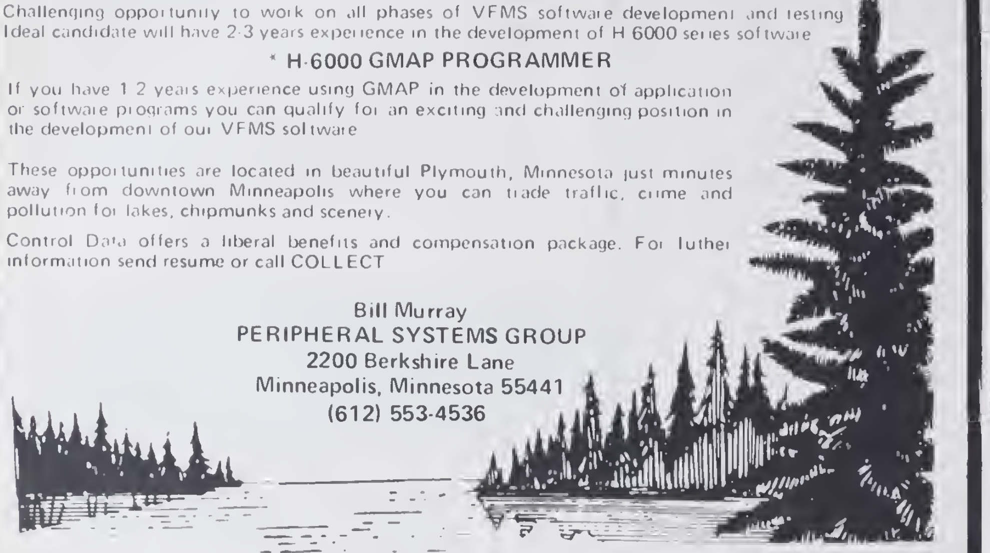

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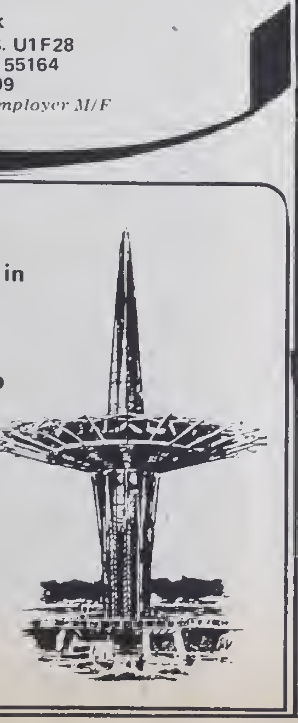

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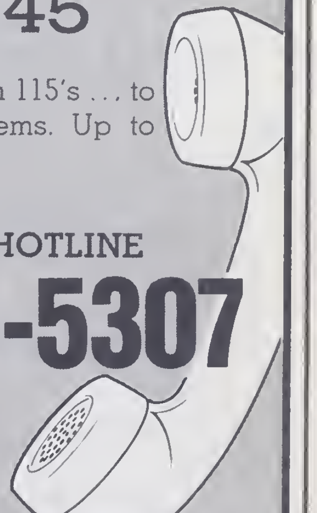

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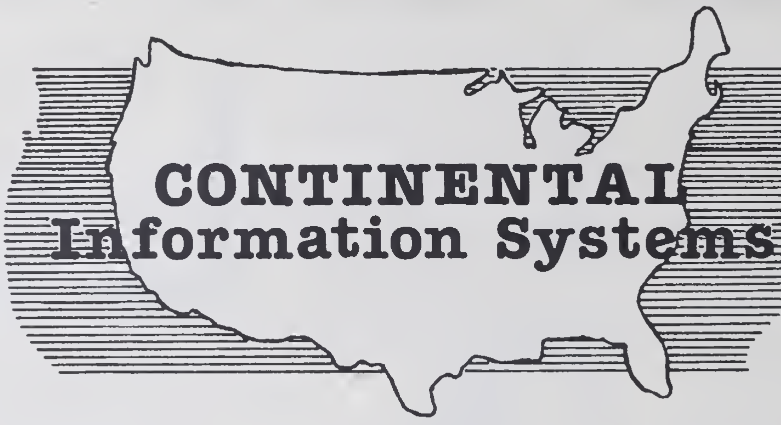

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Sealed proposals will be received by the CDPA, 508 Robert E. Lee Bldg., Jackson, MS 39201, up until 2:00 p.m. 11-14-77 for the following data processing equipment:

Request for Proposal No. **323** for the acquisition of a raster graphics display system to attach to an existing Data General Eclipse S/130.

Request for Proposal No. **324** for the acquisition of a small general purpose computer system and software necessary to process payroll, general accounting, and student scheduling for a small Mississippi junior college.

Request for Propoal No. **325** for the lease of a small graphics system capable of communicating with a 370/155 and producing maps and digitizing mileage from the maps.

Request for Proposal No. **326** for the purchase of a binary synchronous communications adapter to enable a 360 Model 20 to communicate as an RJE station to a 370/155.

Detailed specifications may be obtained from the CDPA office. The CDPA reserves the right to rejct any and all bids and proposals and to waive informalities. Clyde P. Ballard, Executive Director, Central Data Processing Authority.

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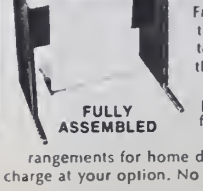

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Request for Proposal No. 327 for the purchase of the necessary modifications to existing Cambridge Memories, Inc. memory to enable the installation of a Dynamic Address Translation (DAT) feature to an existing IBM 370/155.

Request for Proposal No. 328 for the purchase of additional Cambridge Memory (CMI) for an existing IBM 370/155.

Detailed specifications may be obtained from the CDPA office. The CDPA reserves the right to reject any and all bids and proposals and to waive informalities. Clyde P. Ballard, Executive Director, Central Data Processing Authority.

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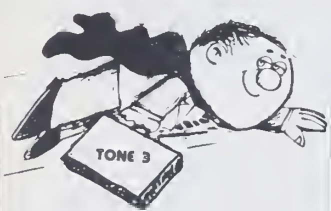

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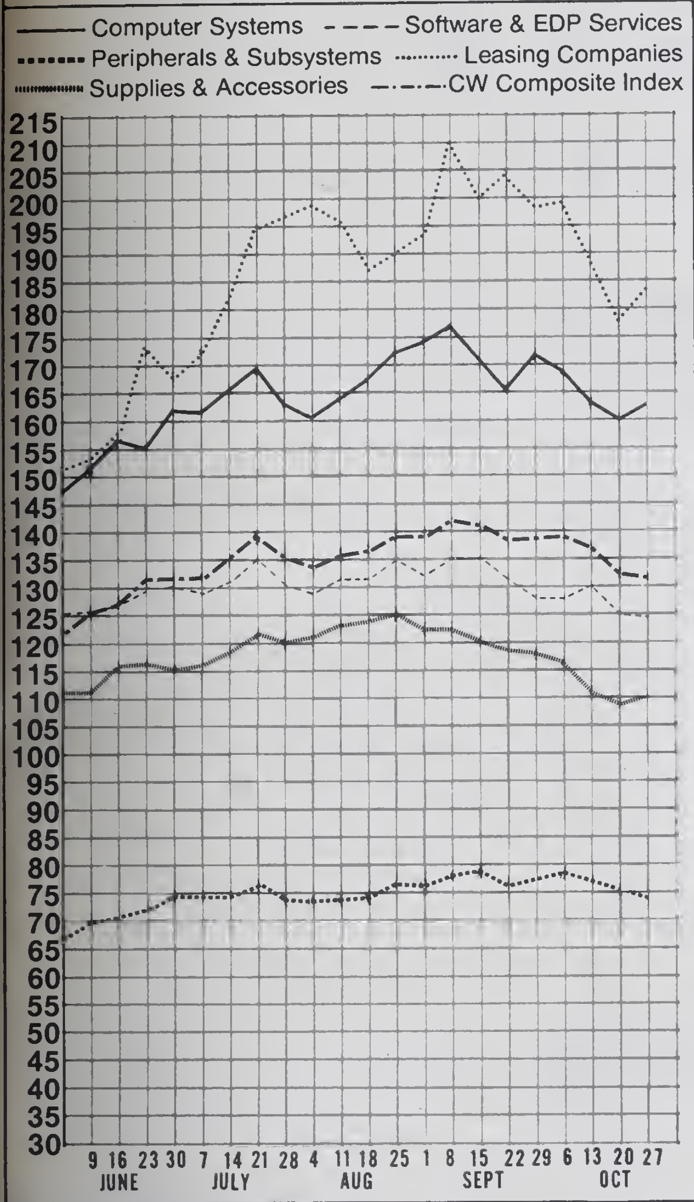

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Earnings	88,000	111,000
6 Mo Shr	.21	.28
Revenue	4,899,000	3,773,000
Earnings	159,000	220,000

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Three Months Ended June 4

	1977	1976
Shr Ernd	$.68	$.52
Revenue	60,507,000	44,470,000
Earnings	6,780,000	5,118,000
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Revenue	168,514,000	114,127,000
Earnings	19,043,000	13,051,000

a-Restated to reflect results of Digital Computer Controls, Inc., acquired on pooling-of-interests basis.

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Three Months Ended June 25

	1977	1976
Shr Ernd	$.44	$.48
Revenue	30,011,000	26,700,000
Earnings	3,319,000	a3,575,000

a-Includes $1,118,000 gain from sale of building.

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Shr Ernd	$.09	$(.28)
Revenue	3,811,000	3,202,000
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Earnings	151,000	(479,000)
6 Mo Shr	.14	(.25)
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Three Months Ended June 30

	1977	1976
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Tax Cred	.....	343,000
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Earnings	(205,000)	1,300,000

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Computerworld Stock Trading Summary

All statistics compiled, computed and formatted
by
TRADE QUOTES, INC.
Cambridge, Mass. 02139

COMPUTER SYSTEMS

EXCH		PRICE 1977 RANGE (1)	CLOSE OCT 26 1977	WEEK NET CHNGE	WEEK PCT CHNGE
O	AMDAHL CORP	22- 44	39 1/4	-3	-7.1
N	BURROUGHS CORP	55- 91	66 1/4	+1 1/4	+1.9
O	COMPUTER AUTOMATION	18- 30	23	+2	+9.5
N	CONTROL DATA CORP	20- 26	21 3/8	+1	+4.9
O	CRAY RESEARCH INC	15- 29	22 1/4	+ 1/4	+1.1
N	DATA GENERAL CORP	35- 51	45	+1 1/2	+3.4
N	DATAPOINT CORP	18- 32	28 1/4	+1	+3.6
N	DIGITAL EQUIPMENT	37- 53	45	+1 7/8	+4.3
N	ELECTRONIC ASSOC.	2- 3	1 7/8	0	0.0
A	ELECTRONIC ENGINEER.	8- 11	9 5/8	- 1/8	-1.2
O	FOUR-PHASE SYSTEMS	13- 19	16 5/8	+ 1/8	+0.7
N	FOXBORO	41- 54	42 3/4	- 5/8	-1.4
O	GENERAL AUTOMATION	6- 9	6	0	0.0
O	GRI COMPUTER CORP	1- 1	1/2	0	0.0
N	HEWLETT-PACKARD CO	69- 87	70 1/2	- 5/8	-0.8
N	HONEYWELL INC	43- 55	45 5/8	+2 3/4	+6.4
N	IBM	245-286	260 1/2	+4 1/2	+1.7
O	MANAGEMENT ASSIST	5- 9	7 1/8	+ 1/8	+1.7
O	MICRODATA CORP	7- 18	11 3/8	+ 1/8	+1.1
O	MODULAR COMPUTER SYS	5- 8	6 1/4	+ 1/8	+2.0
N	NCR	32- 47	41 1/2	+2 3/4	+7.0
O	PRIME COMPUTER INC	12- 23	20 1/2	+ 5/8	+3.1
N	PERKIN-ELMER	17- 22	18 3/4	- 1/4	-1.3
N	RAYTHEON CO	16- 33	29 7/8	+ 3/8	+1.2
N	SPERRY RAND	30- 42	30 3/4	+ 3/4	+2.5
O	SYCOR INC	8- 15	14	+2 1/2	+21.7
A	SYSTEMS ENG. LABS	5- 8	6 7/8	- 3/8	-5.1
A	WANG LABS.	10- 14	11 1/8	- 7/8	-7.2

LEASING COMPANIES

EXCH		PRICE 1977 RANGE (1)	CLOSE OCT 26 1977	WEEK NET CHNGE	WEEK PCT CHNGE
O	ALANTHUS CORP	3- 5	4 1/2	0	0.0
C	BOOTHE COURIER CORP	8- 10	10 3/8	+ 5/8	+6.4
D	COMDISCO INC	10- 13	10 1/2	+ 3/4	+7.6
A	COMMERCE GROUP CORP	1- 3	7/8	0	0.0
A	COMPUTER INVSTRS GRP	1- 2	1	0	0.0
M	DATRONIC RENTAL	0- 2	1 1/8	0	0.0
A	DCL INC	1- 2	2	0	0.0
N	DPF INC	6- 9	7 7/8	+ 1/8	+1.6
N	ITEL	13- 22	17 1/2	+ 5/8	+3.7
N	LEASCO CORP	19- 27	22 3/8	+1 3/8	+6.5
D	LEASPAC CORP	1- 2	1	0	0.0
O	NRG INC	1- 1	1/8	0	0.0
A	PIONEER TEX CORP	5- 11	5 3/8	0	0.0
N	U.S. LEASING	10- 15	12 1/2	+ 5/8	+5.2

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
L=NATIONAL; M=MIDWEST; O=OVER-THE-COUNTER
O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID
(1) TO NEAREST DOLLAR

SOFTWARE & EDP SERVICES

EXCH		PRICE 1977 RANGE (1)	CLOSE OCT 26 1977	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED COMP TECH	1- 2	1/2	0	0.0
D	ANACOMP INC	7- 10	8 1/2	- 1/4	-2.8
A	APPLIED DATA RES.	5- 10	7 1/2	- 3/4	-9.0
N	AUTOMATIC DATA PROC	23- 30	26 1/2	+1 7/8	+7.6
C	COLEMAN AMERICAN COS	2- 2	1 7/8	+ 1/4	+15.3
O	COMPU-SERV NETWORK	9- 15	9 3/4	0	0.0
O	COMP ELECTION SYSTMS	6- 10	9	- 1/2	-5.2
O	COMPUTER HORIZONS	1- 1	1 1/4	0	0.0
O	COMPUTER NETWORK	6- 11	9 1/4	- 1/4	-2.6
N	COMPUTER SCIENCES	7- 9	7 3/4	- 5/8	-7.4
O	COMPUTER TASK GROUP	1- 2	1 7/8	- 1/8	-6.2
O	COMPUTER USAGE	1- 3	1 1/2	+ 3/8	+33.3
C	COMSHARE	5- 8	6 1/2	0	0.0
O	DATA DIMENSIONS INC	3- 5	4 1/8	+1	+32.0
O	DATATAB	1- 2	1 1/4	0	0.0
N	ELECTRONIC DATA SYS.	14- 20	14	- 1/4	-1.7
O	INSYTE CORP	2- 3	1 1/4	- 1/4	-16.6
O	IPS COMPUTER MARKET.	1- 2	1 5/8	0	0.0
O	KEANE ASSOCIATES	3- 4	4 1/4	- 1/8	-2.8
O	KEYDATA CORP	2- 3	1 1/2	- 1/8	-7.6
A	LOGICON	7- 17	12 3/8	+ 1/4	+2.0
A	MANAGEMENT DATA	1- 2	1	- 3/8	-27.2
A	NATIONAL CSS INC	19- 27	24 1/8	- 1/2	-2.0
O	NATIONAL DATA CORP	4- 7	6 1/8	- 1/2	-7.5
A	ON LINE SYSTEMS INC	16- 22	16 3/8	+ 3/8	+2.3
N	PLANNING RESEARCH	3- 6	3 7/6	- 5/8	-13.8
O	PROGRAMMING & SYS	1- 1	3/8	0	0.0
D	RAPIDATA INC	2- 3	2 5/8	+ 1/8	+5.0
O	REYNOLDS & REYNOLD	17- 20	17 1/2	- 1/2	-2.7
O	SCIENTIFIC COMPUTERS	1- 4	3 1/4	- 1/2	-13.3
O	TYMSHARE INC	14- 23	18 7/6	+ 1/4	+1.3
A	URS SYSTEMS	4- 5	4 3/8	0	0.0
N	WYLY CORP	1- 2	3/4	0	0.0

PERIPHERALS & SUBSYSTEMS

EXCH		PRICE 1977 RANGE (1)	CLOSE OCT 26 1977	WEEK NET CHNGE	WEEK PCT CHNGE
N	ADDRESSOGRAPH-MULT	10- 15	12 7/8	+ 1/8	+0.9
O	ADVANCED MEMORY SYS	7- 9	6 3/4	- 1/8	-1.8
N	AMPEX CORP	8- 11	9 1/4	- 3/8	-3.8
O	ANDERSON JACOBSON	3- 5	3 3/4	0	0.0
N	APPLIED DIG DATA SYS	10- 20	13 1/2	- 3/6	-2.7
O	BEEHIVE INT'L	8- 12	7 3/4	- 3/8	-4.6
A	BOLT,BERANEK & NEW	7- 9	7 3/6	+ 3/8	+5.3
N	BUNKER-RAMO	8- 12	10 3/8	- 1/8	-1.1
A	CALCOMP	3- 5	3	0	0.0
O	CAMBRIDGE MEMORIES	1- 4	3 1/2	+ 1/4	+7.6
N	CENTRONICS DATA COMP	20- 30	20 1/2	+ 1/2	+2.5
D	COGNITRONICS	1- 1	3/4	0	0.0
O	COMPUTER COMMUN.	5- 8	5 5/8	- 1/2	-8.1
O	COMPUTER CONSOLES	4- 7	3 3/4	- 1/4	-6.2
A	COMPUTER EQUIPMENT	2- 3	3	0	0.0
O	COMPUTER TRANSCEIVER	1- 1	1 1/4	0	0.0
C	COMTEN	9- 13	9 3/4	- 3/4	-7.1
N	CONRAC CORP	19- 28	19 7/8	-1 3/8	-6.4
O	DATA ACCESS SYSTEMS	4- 5	3 1/2	0	0.0
C	DATA 100	6- 9	7 3/8	0	0.0
A	DATA PRODUCTS CORP	9- 17	15 5/8	+1 1/8	+7.7
O	DATA TECHNOLOGY	3- 4	4 1/4	0	0.0
O	DATUM INC	1- 2	1 3/4	0	0.0
O	DECISION DATA COMPUT	2- 3	1 7/8	- 1/8	-6.2
O	DELTA DATA SYSTEMS	1- 1	3/8	0	0.0
A	DOCUMATION INC	6- 9	7 1/8	- 1/8	-1.7
O	DATARAM CORP	2- 12	10 1/4	- 1/4	-2.3
N	ELECTRONIC M & M	4- 5	3 5/8	- 1/4	-6.4
O	FABRI-TEK	1- 2	1 1/8	-	-5.3
O	GENERAL COMPUTER SYS	0- 2	1 1/8	+ 1/8	+12.5
N	HAZELTINE CORP	8- 12	8 1/8	0	0.0
N	HARRIS CORP	28- 39	36 7/8	-1	-2.6
A	INCOTERM CORP	10- 17	17	+1	+6.2
O	INFOREX INC	4- 7	5	+ 1/2	+11.1
O	INFORMATION INTL INC	9- 14	9 3/4	- 3/4	-7.1
O	INTEL CORP	38- 57	43	+ 1/2	+1.1
A	LUNDY ELECTRONICS	3- 6	4 1/8	- 3/8	-8.3
O	MSI DATA CORP	6- 13	11 7/8	- 3/8	-3.0
O	MEMOREX	23- 34	26 3/4	+ 1/4	+0.9
N	MOHAWK DATA SCI	5- 8	5 3/8	- 3/8	-6.5
O	PENRIL CORP	2- 5	3 3/4	- 1/8	-3.2
A	PERTEC CORP	7- 9	8 3/4	+ 1/8	+1.4
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
C	PRECISION INST.	2- 2	1 1/2	0	0.0
O	QUANTOR CORP	4- 5	3 1/2	- 1/8	-3.4
O	RECOGNITION EQUIP	6- 10	7	- 1/2	-6.6
O	SCAN DATA	1- 2	7/8	-	-6.2
O	STORAGE TECHNOLOGY	10- 18	16 1/8	+ 3/4	+4.8
O	T BAR INC	7- 13	10 5/8	-1 1/2	-12.3
O	TALLY CORP.	4- 6	3 7/8	+ 1/4	+6.8
A	TEC INC	7- 10	7 3/8	+ 1/8	+1.7
N	TEKTRONIX INC	29- 38	37	+1 3/4	+4.9
N	TELEX	2- 3	2 1/8	- 1/8	-5.5
O	WILTEK INC	1- 1	1/2	- 1/4	-33.3

SUPPLIES & ACCESSORIES

EXCH		PRICE 1977 RANGE (1)	CLOSE OCT 26 1977	WEEK NET CHNGE	WEEK PCT CHNGE
A	AMERICAN BUS PRODS	6- 8	5 7/8	- 1/4	-4.0
O	BALTIMORE BUS FORMS	1- 4	1 1/4	0	0.0
A	BARRY WRIGHT	10- 14	12 1/2	+ 1/4	+2.0
O	CYBERMATICS INC	1- 1	1	+ 1/8	+14.2
O	CUPLEX PRODUCTS INC	14- 19	17	0	0.0
N	ENNIS BUS. FORMS	6- 7	5 3/4	- 1/8	-2.1
O	GRAHAM MAGNETICS	11- 17	16 3/4	- 1/8	-0.7
D	GRAPHIC CONTROLS	13- 18	14 1/4	+1 1/2	+11.7
N	3M COMPANY	46- 56	46 1/2	-1 1/2	-3.1
C	MOORE CORP LTD	24- 37	24	-1 5/8	-6.3
N	NASHUA CORP	16- 28	18 5/8	- 3/8	-1.9
O	STANDARD REGISTER	18- 25	21 1/4	+ 3/4	+3.6
D	TAB PRODUCTS CO	10- 19	9 3/4	- 1/4	-2.5
N	UARCO	18- 22	18 1/2	0	0.0
A	WABASH MAGNETICS	10- 15	11 1/4	+ 3/8	+3.4
N	WALLACE BUS FORMS	17- 21	18 5/8	0	0.0

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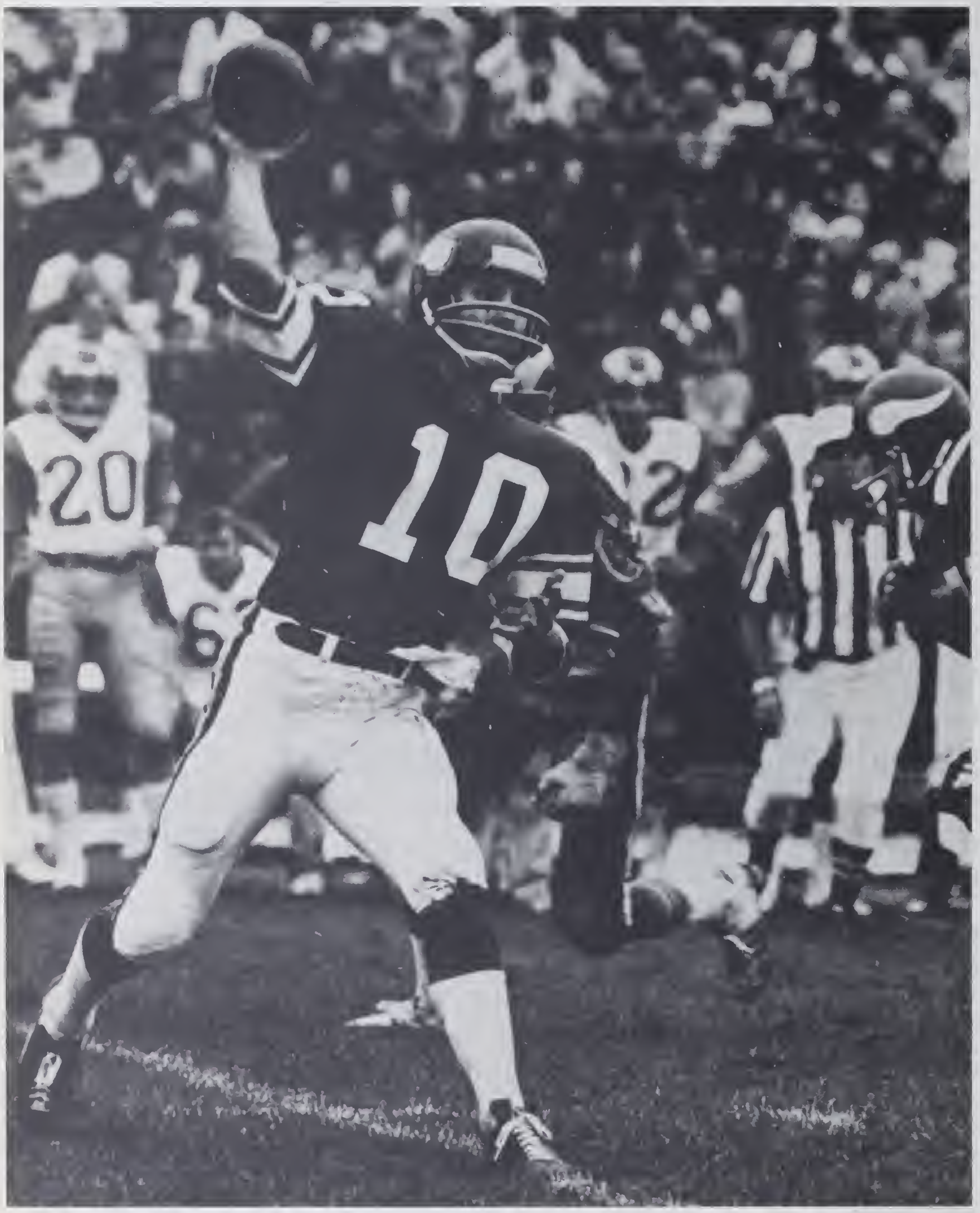

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